

COSMETIC OR DERMOPHARMACEUTICAL COMPOSITIONS
OF CERAMIDES AND POLYPEPTIDES

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] The present application claims priority of French Application No. 03 05707 filed May 12, 2003, the disclosure of which is incorporated herein by reference.

BACKGROUND OF THE INVENTION

[0002] Our skin is the first image each of us offers to those who behold us. From time immemorial, the appearance of the skin has been a subject of preoccupation.

[0003] Our current knowledge of the physiology of the skin now enables us to propose cosmetic solutions to the various dysfunctions induced by external aggression and aging. However, many things remain poorly elucidated, poorly understood and poorly controlled.

[0004] This is true, for instance, in the case of the general symptoms of cutaneous aging, which give rise to wrinkles and flaccid and thin skin. The treatment of those symptoms is an important subject of research for the cosmetic market.

[0005] External or internal factors can both lead to the emergence of symptoms of aging. Moreover, as skin ages, the synthesis of collagen or other macromolecules in connective tissue is slowed; proteolysis, induced by solar radiation, is accelerated and the skin grows thinner and loses elasticity.

[0006] Numerous cosmetic compositions intended to improve the appearance of facial skin have been proposed to date. These include moisturizing products, anti-wrinkle creams and smoothing and soothing lotions. Frequently, however, those products have side effects, are associated with stability problems and/or do not make good their promise over time. This is, in particular, the case for formulae containing vitamins and plant extracts.

[0007] The present invention is designed to assist in resolving the esthetic problems posed by those aging symptoms and, preferably, to address the underlying problems.

[0008] A few peptides and peptide derivatives have already been described in the context of cosmetic uses as in, for example, K. Lintner and O. Peschard: 'Biologically active peptides,' *Int. J. Cosm. Sci.* 22, 207-218, 2000 and French Patent No. 2,688,365 published April 30, 1992 and granted December 23, 1994. In addition, Sederma SAS has been selling a product including about 100 ppm of Palmitoyl-Val-Gly-Val-Ala-Pro-Gly (SEQ ID NO: 1). This product, sold under the trade name BIOPEPTIDE EL, is used for helping restore the suppleness and firmness of skin, but not for treating wrinkles. Other polypeptides of various lengths of amino acids are also known. These include N-palmitoyl-Gly-His-Lys sold by Sederma SAS under the trade name BIOPEPTIDE CL and N-palmitoyl-Lys-Thr-Thr-Lys-Ser (SEQ ID NO: 2) also sold by Sederma SAS under the trade name MATRIXYL. Ceramides are a class of compounds also known for use in personal care products. Usually ceramides are used to help treat dry skin.

SUMMARY OF THE INVENTION

[0009] In one particularly preferred aspect of the present invention there is provided a personal care product, cosmetic or dermatopharmaceutical composition (collectively a cosmetic composition) that includes effective amounts of at least one polypeptide of between 3 and 12 amino acids in length and at least one ceramide. More particularly, there is provided a cosmetic composition comprising at least one polypeptide having an amino acid sequence of from 3 to 12 amino acids in length or an N-acyl derivative thereof having anti-aging activity. Anti-aging activity means some degree or capacity for treating or preventing one or more signs, symptoms and/or causes of skin aging. An example is a polypeptide which has the ability to treat skin wrinkles. The polypeptide is provided in an amount which is effective to treat at least one sign of skin aging. These compositions also include at least one ceramide capable of providing an improvement in the anti-aging activity of the polypeptide. This means that the polypeptide has an objectively measurable increase in its

effect on some aspect of aging when used with the ceramide. This can be, for example, a greater reduction in wrinkles, increased potency, the ability to stimulate or inhibit at least one biochemical process within the skin to a greater degree, and the like. The ceramide is present in an amount which is sufficient to provide an improvement in the anti-aging activity of the polypeptide, and at least one additional ingredient.

[0010] Certain polypeptides as described and claimed herein, when properly formulated and applied, can be used therapeutically and/or cosmetically to reduce signs of aging and, in a preferred embodiment, reduce skin wrinkles. It has now been found that when such polypeptides are mixed with ceramides and in particular certain ceramides, the resulting degree of, for example, antiwrinkle activity observed is higher than that observed for the polypeptide alone. This is a particularly surprising result in view of the fact that ceramides are generally used in the treatment of dry and chapped skin.

[0011] These formulations preferably require an effective amount of polypeptide. This means that the content and/or concentration of the polypeptide in the formulation is sufficient that when the formulation is applied with normal frequency and in a normal amount, the formulation can result in the treatment and/or prevention of various signs or symptoms of skin aging and in particular, wrinkles. The amount can also be an amount sufficient to inhibit or enhance some biochemical function occurring within the skin. This amount of polypeptide is combined with an amount of at least one ceramide, which is effective to increase for example, the antiwrinkle activity of the polypeptide when compared to that of the same amount of the same polypeptide applied in the absence of the ceramide. The amount may vary when other signs of aging are to be addressed. Cosmetic, personal care and dermatological formulations including polypeptides and ceramides, and further comprising at least one additional

ingredient such as, for example, a cream, gel or lotion base and/or a solvent or carrier, as well as the use of such formulations for the production of a medicament useful for the treatment of signs of skin aging and in particular wrinkles, as well as methods of their use are also contemplated.

[0012] In accordance with one aspect of the present invention, the polypeptides useful include between about 3 and about 5 amino acids in length. Particularly preferred tripeptides for use in accordance with the present invention include Gly-His-Lys. A particularly preferred tetrapeptide in accordance with the present invention includes Gly-Gln-Pro-Arg (SEQ ID NO: 3). Mixtures of these tri and tetra peptides are also contemplated. Analogs and derivatives of these tri and tetra peptides such as N-Palmitoyl-Gly-Gln-Pro-Arg (SEQ ID NO: 3) are also useful. A preferred pentapeptide in accordance with the present invention includes the sequence Lys-Thr-Thr-Lys-Ser (SEQ ID NO: 2). Analogs of these pentapeptides, as well as their derivatives and in particular an acyl derivative such as N-Palmitoyl-acyl derivatives thereof are also useful.

Mixtures including two or more of tri-, tetra- and pentapeptides as described herein are also contemplated. These are preferably mixed with at least one ceramide as described.

[0013] In another particularly preferred embodiment in accordance with the present invention, the ceramide/polypeptide mixtures include polypeptides having between 6 and 12, and more preferably between 6 and 9 amino acids in length, as well as analogs and derivatives thereof. Even more preferably, these polypeptides of 6 to 12 amino acids in length include within their sequence the sequence Val-Gly-Val-Ala-Pro-Gly (SEQ ID NO: 1) and analogs thereof.

[0014] In particular embodiments of this invention, these polypeptides can be represented by the structural Formula I: $R_1-(AA)_n\text{-Val-Gly-Val-Ala-Pro-Gly}(XX)_m\text{-OR}_2$ (SEQ ID NO: 4), in which $(AA)_n$ and $(XX)_m$ are amino acid chains and (AA) and (XX) may be the same or different and include any amino acid or derivative of an amino acid. In Formula I, "n" is between 0

and 3, "m" is between 0 and 3. R_1 may be H or an alkyl chain of carbon length between C_2 and C_{22} , linear or branched, substituted or unsubstituted, saturated or unsaturated, hydroxylated or not, containing sulfur or not or containing a biotinyl group, R_2 may be H or an alkyl chain of carbon length between C_1 and C_{24} , preferably C_1 to C_3 or C_{14} to C_{18} . In the alternative, OR_2 may equal NR_3R_4 , in which R_3 and R_4 are independently of each other H or an alkyl chain of carbon length of between C_1 and C_{12} . In a particularly preferred embodiment of this aspect of the invention, it is preferred that the total of m and n are no more than 3, and even more preferably both n and m are zero. Preferably, R_1 is an acyl group such as a Palmitoyl group and R_2 is H when the resulting polypeptide is used with a ceramide.

[0015] Any ceramide which, when combined with one or more of the polypeptides, analogs or derivatives thereof described herein can provide additional activity in terms of mitigating one or more of the known signs of aging and in particular, improved antiwrinkling activity are contemplated. Particularly preferred are effective amounts of ceramides based on N-acyl-sphingosine and N-acyl-Dihydrosphingosine (also called N-acyl-sphinganine). Particularly preferred is N-stearoyl-sphinganine.

[0016] The present invention also relates to the use of such compositions to make cosmetics, personal care products, topical pharmaceutical preparations or medicaments for reducing visible signs of such aging in human skin and more preferably wrinkles. This is accomplished by topical application of these products including both a polypeptide and ceramide to the skin of a patient, often a human, needing such treatment. The present invention also relates to methods of using such compositions to improve the state and appearance of human skin and to prevent and/or reduce the visible signs of aging. These methods generally include the topical application of a desired amount of a formulation in accordance with the present invention to an area of the skin where

needed. This is repeated at a frequency best suited for the specific formulation and purpose.

[0017] In one preferred aspect of the present invention, there are also provided compositions which do not include ceramides, but include the polypeptides having between 6 and 12 amino acids. Particularly preferred polypeptides include the sequence Val-Gly-Val-Ala-Pro-Gly (SEQ ID NO: 1), their analogs and derivatives. In such ceramide free formulations, the amino acid derivatives do not include a palmitoyl group as an N-acyl substituent when the C-terminus ends in an acid group in formulations useful for treating visible signs of aging and in particular wrinkles.

[0018] In accordance with another preferred embodiment of the present invention, there is provided a method of treating or preventing at least one sign of skin aging in a human. The method includes at least the step of obtaining an amount of a cosmetic composition which comprises at least one polypeptide having an amino acid sequence of from 3 to 12 amino acids in length or an N-acyl derivative thereof and having anti-aging activity. The cosmetic composition also includes at least one ceramide. The ceramide is preferably provided in an amount that is greater than the amount of the polypeptide. The cosmetic composition also includes at least one additional ingredient. The method also includes the step of applying an amount of the cosmetic composition to the skin of a human in need of anti-aging treatment or protection. Often, the cosmetic composition is applied to the skin in need of treatment or protection once a day or twice a day. This continues for at least one week. The amount of the cosmetic composition applied each time generally ranges from about 0.1 to about 10 mg/m² of skin.

DETAILED DESCRIPTION

[0019] All publications cited herein are hereby incorporated by reference in their entirety.

[0020] In accordance with one aspect of the present invention, the polypeptides used in combination with ceramide

include between about 3 and about 5 amino acids in length. Particularly preferred tripeptides for use in accordance with the present invention include Gly-His-Lys. A particularly preferred tetrapeptide in accordance with the present invention includes Gly-Gln-Pro-Arg (SEQ ID NO: 3). Mixtures of these tri and tetra peptides are also contemplated. A preferred pentapeptide in accordance with the present invention includes the sequence Lys-Thr-Thr-Lys-Ser (SEQ ID NO: 2). Analogs of these tri, tetra and penta peptides, as well as their derivatives and in particular an acyl derivative such as N-Palmitoyl derivatives thereof are also preferred. Mixtures including two or more of tri-, tetra- and penta-peptides as described herein, as well as their analogs and derivatives are also contemplated.

[0021] Other tri, tetra and penta peptides that may be useful in accordance with the present invention include, without limitation, the following. Suitable tripeptides for use herein include Arg-Lys-Arg, Gly-Lys-His, Gly-His-Lys, His-Gly-Gly, Lys-Phe-Lys, N-elaidoyl-Lys-Phe-Lys and their analogs or acyl-derivatives of conservative substitution, N-Ac-Arg-Lys-Arg-NH₂, and derivatives thereof. Suitable pentapeptides for use herein include, but are not limited to N-palmitoyl-Lys-Thr-Thr-Lys-Ser (SEQ ID NO: 2), N-palmitoyl-Tyr-Gly-Gly-Phe-X (SEQ ID NO: 5) with X Met or Leu or mixtures thereof and derivatives thereof. Preferred tripeptides and derivatives thereof include N-palmitoyl-Gly-His-Lys (BIOPEPTIDE CL from SEDERMA, France), Peptide CK (Arg-Lys-Arg) and Lipospondin (N-elaidoyl-Lys-Phe-Lys) and its conservative substitution analogs, Peptide CK+ (N-Ac-Arg-Lys-Arg-NH₂). Suitable pentapeptides for use herein also include N-Pal-Lys-Thr-Thr-Lys-Ser (SEQ ID NO: 2), available as MATRIXYL® from SEDERMA, France.

[0022] In another particularly preferred embodiment in accordance with the present invention, the polypeptides useful in some of the cosmetic compositions of the present invention preferably include from 6 amino acids (hexapeptides) to as

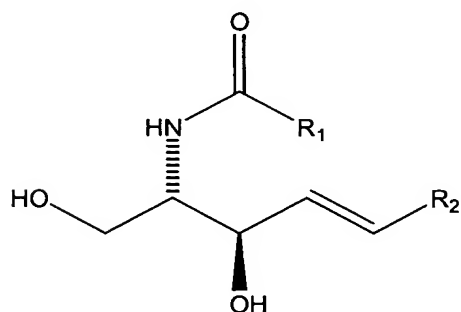
many as 12 amino acids. Even more preferred are polypeptides of Formula I where n or m is zero or the total of m and n is no more than 3. Thus, the polypeptides preferably have between 6 and 9 amino acids within their chain. Even more preferred are those polypeptides including the sequence Val-Gly-Val-Ala-Pro-Gly (SEQ ID NO: 1), its analogs and its derivatives, particularly its acyl-derivatives. Even more preferred is the hexapeptide Val-Gly-Val-Ala-Pro-Gly (SEQ ID NO: 1), its analogs and derivatives.

[0023] In a particularly preferred embodiment in accordance with the present invention, the ceramide/polypeptide mixtures include polypeptides having between 6 and 12, and more preferably between 6 and 9 amino acids in length, as well as analogs and in particular acyl derivatives thereof. Even more preferably, these polypeptides of 6 to 12 amino acids in length include within their sequence the sequence Val-Gly-Val-Ala-Pro-Gly (SEQ ID NO: 1) and analogs thereof. In particular, these polypeptides can be represented by the structural Formula I: $R_1-(AA)_n\text{-Val-Gly-Val-Ala-Pro-Gly}(XX)_m\text{-OR}_2$ (SEQ ID NO: 4), in which $(AA)_n$ and $(XX)_m$ are amino acid chains and (AA) and (XX) may be the same or different and include any amino acid or derivative of an amino acid. In Formula I, "n" is between 0 and 3, "m" is between 0 and 3. R_1 may be H or an alkyl chain of carbon length between C_2 and C_{22} , linear or branched, substituted or unsubstituted, saturated or unsaturated, hydroxylated or not, containing sulfur or not or containing a biotinyl group, R_2 may be H or an alkyl chain of carbon length between C_1 and C_{24} , preferably C_1 to C_3 or C_{14} to C_{18} . In the alternative, OR_2 may equal NR_3R_4 , in which R_3 and R_4 are independently of each other H or an alkyl chain of carbon length of between C_1 and C_{12} . In a particularly preferred embodiment of this aspect of the invention, it is preferred that the total of m and n are no more than 3, and even more preferably both n and m are zero. Preferably, R_1 is an acyl group such as a Palmitoyl group and R_2 is H. Polypeptides

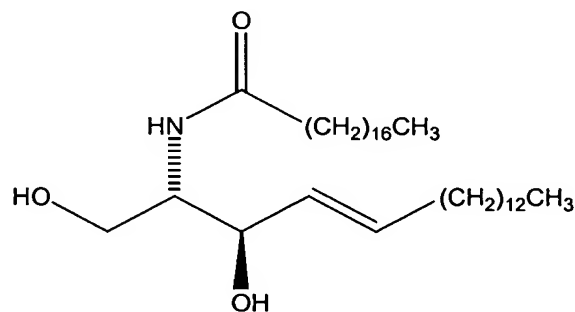
containing analogs of that portion of the sequence Val-Gly-Val-Ala-Pro-Gly (SEQ ID NO: 1) are also contemplated.

[0024] In another preferred embodiment, the compositions of the present invention contain one or more ceramides, particularly those of the type N-acyl-sphingosine or N-acyl-sphinganine, as disclosed, for instance, in Wertz *et al.*, *J. Invest. Dermatol.* 84, 410-412, 1985 or in FR 2668485 of 24.10.1990 awarded to Daniel Greff, or, for instance, in EP0647617 awarded to Didier Semera *et al.*, their analogs and derivatives.

[0025] The ceramides are a class of complex lipids discovered in the superior strata of the epidermis (e.g.: cf. Wertz *et al.*, *J. Invest. Dermatol.* 84, 410-412, 1985) (particularly preferred ceramides disclosed in Wertz are ceramides 1, 3 and 4-7). Ceramides have the following general formula A:



Formula A



Formula B

however, this basic structure can be modified and derivatized as, for example in Formula B. Ceramide (N-Acyl-D-erythro-sphingosine) is a structural component of mammalian glycolipids and the phospholipid, sphingomyelin. Other preferred ceramides include trihydroxypalmitamidohydroxypropylmyristyl ether, n-stearoyl-dihydrosphingosine and palmitamido myristyl serimate. Other ceramides useful in accordance with the invention include ceramides of the above structure (Formula A) wherein the acyl group R_1 (represented in Formula B as having a $-(CH_2)_{16}CH_3$ group)

is a fatty chain of C₁₄-C₂₂. R₂ in Formula A may be the same or different and is a fatty chain of C₁₄-C₂₂. The fatty chain may be saturated or unsaturated, substituted or unsubstituted, straight chain or branched. Ceramides wherein R₁ is 10 carbons or less are not preferred.

[0026] Considerable research has been devoted to obtaining ceramides (extraction, synthesis) and to their cosmetic use. Ceramides strengthen the cutaneous barrier and regulate the water flux across the *stratum corneum* (e.g.: cf. Lintner et al. *Int. J. Cosmet. Sci* 19, 15-25, 1997).

[0027] It has now been discovered that the concomitant use of the peptides in accordance with the present invention and contain ceramides, in cosmetic, personal care or dermatopharmaceutical compositions can, in many preferred embodiments, enhance anti-aging effects and reduce signs of skin aging considerably. In particular, these cosmetic compositions can be used to treat or prevent wrinkles.

[0028] One or more "additional ingredients," including one or more dermatologically acceptable carrier(s) are also preferably used in these peptide and peptide/ceramide compositions.

[0029] The term "dermatologically acceptable," as used herein, means that the compositions or components described are suitable for use in contact with human skin without risk of toxicity, incompatibility, instability, allergic response, and the like.

[0030] All terms such as "skin aging," "signs of skin aging," "topical application," and the like are used in the sense in which they are generally and widely used in the art of developing, testing and marketing cosmetic and personal care products. "Wrinkles" means furrows in the otherwise smooth surface of the facial skin, visible to the naked eye, in the average depth of 50 to more than 200 μ m and essentially appearing with progressive age. The term "cosmetic composition" or more briefly just "composition" in accordance with the present invention relates to a formulation that can

be used for cosmetic purposes, purposes of hygiene or as a basis for delivery of one or more pharmaceutical ingredients. This includes cosmetics, personal care products and pharmaceutical preparations. It is also possible that these formulations are used for two or more of these same purposes at one time. A medicated dandruff shampoo, for example, has pharmacological properties and is used as a personal care product to provide clean hair. These compositions may also include additional ingredients such as a dermatologically acceptable carrier.

[0031] "Cosmetics," as used herein, include without limitation, lipstick, mascara, rouge, foundation, blush, eyeliner, lipliner, lip gloss, facial or body powder, sunscreens and blocks, nail polish, mousse, sprays, styling gels, nail conditioner, whether in the form of creams, lotions, gels, ointments, emulsions, colloids, solutions, suspensions, compacts, solids, pencils, spray-on formulations, brush-on formulations and the like. "Personal care products" include, without limitation, bath and shower gels, shampoos, conditioners, cream rinses, hair dyes and coloring products, leave-on conditioners, sunscreens and sunblocks, lip balms, skin conditioners, cold creams, moisturizers, hair sprays, soaps, body scrubs, exfoliants, astringents, depilatories and permanent waving solutions, antidandruff formulations, antisweat and antiperspirant compositions, shaving, preshaving and after shaving products, moisturizers, deodorants, cold creams, cleansers, skin gels, rinses, whether in solid, powder, liquid, cream, gel, ointment, lotion, emulsions, colloids, solutions, suspensions, or other form. "Pharmaceutical preparations" in accordance with the present invention include, without limitation, carriers for dermatological purposes, including topical and transdermal application of pharmaceutically active ingredients. These can be in the form of gels, patches, creams, nose sprays, ointments, lotions, emulsions, colloids, solutions, suspensions, powders and the like. Compositions in accordance

with the invention include cosmetics, personal care products and pharmaceutical preparations.

[0032] The term "hexapeptide" in accordance with the present invention is a compound that includes an uninterrupted sequence of six amino acids within its structure. These are indicated herein using a traditional three letter convention from left (N-terminal end) to right (C-terminal end). In this nomenclature, Val is valine, Gly is glycine, Ala is Alanine, Pro is proline. The term "polypeptide" in accordance with the present invention means a compound that includes an uninterrupted sequence of between 3 and 12 amino acids, and therefore includes tripeptides, tetrapeptides, pentapeptides and hexapeptides. More preferably, the polypeptides used in combination with one or more ceramides include between 6 and 9 amino acids and even more preferably includes the sequence Val-Gly-Val-Ala-Pro-Gly (SEQ ID NO: 1).

[0033] The term "amino acid" as employed herein includes and encompasses all of the naturally occurring amino acids, either in the D- or L-configuration if optically active, and the known non-native, synthetic, and modified amino acids, such as homocysteine, ornithine, norleucine and p-valine. A list of non-natural amino acids may be found in *The Peptides*, Vol. 5 (1983), Academic Press, Chapter VI, by D. C. Roberts and F. Vellaccio. The amino acids in the peptides of the present invention may be present in their natural L-configuration, unnatural D-configuration, or as a racemic mixture.

[0034] "Signs of skin aging" and other phrases similarly referring to, for example, symptoms of aging and the like include, but are not limited to, all outward visibly and tactilely perceptible manifestations as well as any other macro or micro effects due to skin aging. Such signs may be induced or caused by intrinsic factors and/or extrinsic factors, e.g., chronological aging and/or environmental damage. These signs may result from processes which include, but are not limited to, the development of textural

discontinuities such as wrinkles and coarse deep wrinkles, skin lines, crevices, bumps, large pores (e.g., associated with adnexal structures such as sweat gland ducts, sebaceous glands, or hair follicles), or unevenness or roughness, loss of skin elasticity (loss and/or inactivation of functional skin elastin), sagging (including puffiness in the eye area and jowls), loss of skin firmness, loss of skin tightness, loss of skin recoil from deformation, discoloration (including undereye circles), blotching, sallowness, hyperpigmented skin regions such as age spots and freckles, keratoses, abnormal differentiation, hyperkeratinization, elastosis, collagen breakdown, and other histological changes in the stratum corneum, dermis, epidermis, the skin vascular system (e.g., telangiectasia or spider vessels), and underlying tissues, especially those proximate to the skin. Particularly preferred in accordance with the present invention, the signs of skin aging are wrinkles and the compositions of the present invention are, in certain preferred embodiments, useful in fighting, treating or preventing wrinkles.

[0035] As used herein, prophylactically regulating a skin condition includes delaying, minimizing and/or preventing visible and/or tactile discontinuities in skin (e.g., texture irregularities in the skin which may be detected visually or by feel), including signs of skin aging.

[0036] As used herein, therapeutically regulating skin condition includes ameliorating, e.g., diminishing, minimizing and/or effacing, discontinuities in skin, including signs of skin aging. Some of the products produced using the compositions of the present invention and indeed the compositions themselves may be used for prophylactically or therapeutically regulating a skin condition.

[0037] Some of the products and compositions of the present invention are useful for improving skin appearance and/or feel of skin exhibiting signs of skin aging. For example, preferred compositions of the present invention are useful for regulating the appearance of skin conditions by providing an

immediate visual improvement in skin appearance following application of the composition to the skin. Generally speaking, compositions of the present invention which further contain particulate materials will be most useful for providing the immediate visual improvement.

[0038] Some of the compositions of the present invention may also provide additional benefits, including stability, absence of significant (consumer-unacceptable) skin irritation, anti-inflammatory activity and good aesthetics.

[0039] In certain preferred aspects, the present invention is useful for improving the physiological state and/or the physical appearance of human skin, in particular to reduce the signs of skin aging that are generated by sun exposure, physical and hormonal stress, abrasion, nutritional effects and other similar causes. The compositions may often be used to prevent the signs of aging and/or to treat them in order to afford the consumer who uses them, a more youthful appearance.

[0040] While the specification concludes with the claims particularly pointing and distinctly claiming the invention, it is believed that the present invention will be better understood from the following description. The terms "having" and "including" are to be construed as open-ended unless the context suggests otherwise.

[0041] All percentages and ratios used herein are by weight of the total composition and all measurements made are at 25°C unless otherwise designated.

[0042] The compositions of the present invention can comprise or consist essentially of the components of the present invention as well as other ingredients described herein. As used herein, "consisting essentially of" means that the composition or component may include additional ingredients, but only if the additional ingredients do not materially alter the basic and novel characteristics of the claimed compositions or methods. Preferably, such additives will not be present at all or only in trace amounts. However, it may be possible to include up to about 10% by weight of

materials that could materially alter the basic and novel characteristics of the invention as long as the utility of the compounds (as opposed to the degree of utility) is maintained.

[0043] The peptide, Val-Gly-Val-Ala-Pro-Gly (SEQ ID NO: 1), is a fragment of the protein called elastin. It is the most frequently repeated sequence in that protein. The peptide's chemotactic activity (the property of attracting fibroblasts to a site of inflammation or cicatrization) has been reported (cf. Senior et al. *J. Cell Biol.* 99, 870-874, 1984).

[0044] It has now been found that derivatization of that peptide to yield more lipophilic structures considerably enhances the skin penetration power of the peptide derivatives thus obtained and hence enables potentiation or even initiation of the cosmetic activity that requires the transport of the peptide derivative to the living tissues of the skin. During the research on the present invention, it was discovered that this peptide, in particular its derivatized form, Palmitoyl-Val-Gly-Val-Ala-Pro-Gly-OH (SEQ ID NO: 1), is endowed with unsuspected cosmetic activities, namely a firming and restructuring effect on the skin of the neck and face. Through the restructuring effect, it also contributes to enhanced moisturization of the skin. These properties are improved by the combination with ceramides.

[0045] In order to implement the invention, it is sufficient to incorporate the active compounds at sufficient and effective concentrations in acceptable cosmetic or dermatopharmaceutical compositions and to apply a sufficient and effective quantity to the affected parts of the face, body or hair for a period ranging from 2 weeks to 2 months or more.

[0046] In order to enhance the bioavailability and cutaneous barrier crossing of those peptides, their lipophilicity or lipophilic character can be increased either by acylation of the N-terminal NH₂ group of the peptide, by esterification of the carboxyl group with an alcohol, linear or branched, saturated or unsaturated, hydroxylated or not, or both, yielding compounds of formula I: R₁-(AA)_n-Val-Gly-Val-

Ala-Pro-Gly-(XX)_m-OR₂ (SEQ ID NO: 4), in which (AA)_n and (XX)_m are the same or different peptide chains and (AA) and (XX) are any amino acid or derivative of an amino acid, in which 'n' is between 0 and 3, 'm' is between 0 and 3, and in which R₁ is H or an alkoyl chain of carbon length between C₂ and C₂₂, linear or branched, saturated or unsaturated, hydroxylated or not, containing sulfur or not, or the biotinyl group and R₂ is H, or an alkyl chain of carbon length C₁ to C₂₄, preferably C₁ to C₃ or C₁₄ to C₁₈, or OR₂ = NR₃R₄, in which R₃ and R₄ are, independently of each other, H or an alkyl chain of carbon length between C₁ and C₁₂. Preferably the total of m+n is no greater than 3.

[0047] In preferred methods of implementation of the invention, R₁ is lauroyl (C₁₂) or myristoyl (C₁₄) or stearoyl (C₁₈) or oleoyl (C_{18:1}) or arachidic (C₂₀) or linoleoyl (C_{18:2}) or Palmitoyl, and n is 0 or 1 and R₂ = H or methyl or ethyl, or OR₂ = NR₃R₄, in which R₃ = R₄ = H or methyl. In a particularly preferred embodiment when n=0, R₁ is either not H or Palmitoyl or R₂ is not H. This is unless a ceramide is used in the resulting formulation as well.

[0048] Polypeptides including elastin fragment peptides and peptide derivatives may be obtained by conventional chemical synthesis (in heterogeneous or homogeneous phase) or by enzymatic synthesis (Kullman et al., *J. Biol. Chem.* 255, 8234, 1980) from the amino acids that constitute them or their derivatives.

[0049] The polypeptides and polypeptide derivatives may also be obtained by fermentation of a bacterial strain that has or has not been modified by genetic engineering to produce the required sequences or their various fragments.

[0050] Lastly, the peptides may be obtained by extraction from proteins of animal or plant origin liable to contain those sequences in their structure, followed by controlled hydrolysis, enzymatic or non-enzymatic, to release the desired peptide fragment.

[0051] In order to implement the invention, it is possible, but not necessary, to extract the proteins concerned first and hydrolyze them subsequently or to conduct hydrolysis first on a raw extract and purify the peptide fragments subsequently. The hydrolysate may also be used without extracting the peptide fragments in question, providing that the enzymatic hydrolysis reaction is arrested at the right time and the peptides in question are assayed by appropriate analytical means (radioactive marker, immunofluorescence or immunoprecipitation with specific antibodies, etc.).

[0052] Other more simple or more complex processes yielding cheaper or more pure products may readily be envisaged by the professional with an understanding of the extraction and purification of proteins and peptides.

[0053] The polypeptides or their derivatives of the present invention are used in the cosmetic compositions compliant with the invention at concentrations ranging from 0.00001% (w/w) ("w/w" is weight/weight) and 10% (w/w), but preferably between 0.0001% (w/w) and 1% (w/w). Another useful range is from about 0.001 and about 5% (w/w). Another preferred range is 1 ppm to about 500 ppm. In another preferred embodiment, the polypeptide is provided in an amount of between about 100 and about 400 ppm (w/w), and the ceramide between about 1 and about 8% (w/w).

[0054] The combination of the peptides that constitute the subject of the invention with ceramides requires ceramide concentrations ranging from 0.0001% to 10% (w/w) for the ceramide or ceramides, but preferably between 0.001 and 10.0% (w/w). Another useful range is from about 0.001 to about 5% (w/w), and even more preferably between 0.01 and 1.0% (w/w).

[0055] In a preferred embodiment, the amount of polypeptide relative to the amount of ceramide in the compositions of the present invention is such that a greater amount of ceramide is used. The ratio of polypeptide to ceramide can range from about 1:100,000 to about 1:10; more preferably from about 1:10,000 to about 1:100 (w/w). In another preferred

embodiment, the amount of ceramide contemplated is an amount which is effective to provide an improved result in terms of the performance of an effective amount of a polypeptide. The effective amount of polypeptide will differ with the type of polypeptide selected, its length in terms of amino acids, the type of formulation in which it is compounded, and the methods by which and for which it is used. However, an effective amount is an amount which, when applied with typical frequency and in typical amounts, can produce, for example, at least a reduction in visible signs of aging and preferably a reduction in wrinkles. An effective amount of ceramide is therefore an amount which, when added to the effective amount of polypeptides in accordance with the present invention, actually improves the resulting compositions antiaging properties such as providing an enhanced degree of antiwrinkle activity when compared to the polypeptide alone.

[0056] In one particular mode of implementation of the invention, the cosmetic compositions contain the peptide, Palmitoyl-Val-Gly-Val-Ala-Pro-Gly-OH (SEQ ID NO: 1), at an amount ranging from 0.0001% (w/w) to 10.0% (w/w) and the ceramide in the form of N-stearoyldihydrosphingosine at a concentration between 0.001% and 1.0% (w/w). In a particularly preferred embodiment, the amount of the hexapeptide is 0.002%, and the amount of ceramide 2 is 4% (w/w). This is preferably formulated in an oil base. Other ceramides and peptide derivatives of the general sequence described may be advantageously used within the context of the present invention.

[0057] Specifically, the combination of the peptides and peptide derivatives that constitute the subject of the present invention with other cosmetic active substances (*vide infra*), with or without ceramides, is an advantageous implementation of the invention.

[0058] The peptides compliant with the present invention may be used in cosmetic compositions compliant with the invention either as the peptides themselves or in the form a

premix in a suitable excipient and they may be used in the form of a solution, dispersion, emulsion, paste or powder. They may individually or with other active substances, cited or not cited, be carried by cosmetic vectors such as macro-, micro- or nanocapsules, liposomes or chylomicrons, macro-, micro- or nanoparticles or microsponges. They may also be adsorbed on powdered organic polymers, talcs, bentonites and other inorganic carriers.

[0059] The peptides may be used in any form or in a form that is bound, incorporated, absorbed in or adsorbed on macro-, micro- and nanoparticles, macro-, micro- and nanocapsules for the treatment of textiles, synthetic or natural fibers, wools and all materials liable to be used in the manufacture of clothing or underwear for the day or night, intended for contact with the skin, such as pantyhose, underwear, handkerchiefs and wipes, in order to exert a cosmetic effect through the contact between the textile and skin and enable continuous topical delivery.

[0060] Polypeptides, Analogs and Derivatives

[0061] In one embodiment, the cosmetic compositions of the present invention contain a safe and effective amount of a polypeptide selected from those having between 6 and 12, preferably 6 to 9 amino acids in their structure, analogs, derivatives, and mixtures thereof. These polypeptides may be naturally occurring or of synthetic origin.

[0062] Preferred polypeptides in accordance with this aspect of the present invention are based on the hexapeptide of the structure Val-Gly-Val-Ala-Pro-Gly (SEQ ID NO: 1), a fragment of elastin and its analogs and derivatives thereof.

[0063] Val-Gly-Val-Ala-Pro-Gly (SEQ ID NO: 1) is a preferred hexapeptide. Analogs of this hexapeptide useful in accordance with the present invention include those in which one or more of the six amino acids are reorganized or rearranged within the sequence (e.g., Gly-Val-Gly-Ala-Pro-Gly (SEQ ID NO: 1)) and/or where no more than three of the amino acids are substituted (e.g., Leu-Gly-Leu-Ala-Pro-Leu (SEQ ID

NO: 6)). Most preferably, at least one of the amino acids within the sequence is Pro and most preferably the hexapeptide includes both Pro and Val although their order and position may vary. The amino acid substitutions can be from amongst any amino acid as defined herein. However, most preferably, amino acids substituted for one or two of the amino acids found in Val-Gly-Val-Ala-Pro-Gly (SEQ ID NO: 1) are Leu, Ile and Ala. Most preferably, the analog is more lipophilic than the hexapeptide Val-Gly-Val-Ala-Pro-Gly (SEQ ID NO: 1).

[0064] These same analogs are preferred when the hexapeptide just described is a part of a longer polypeptide of between 7 and 12 amino acids in length. The remaining amino acids can be any natural or synthetic amino acids known, in any order or arrangement. Where the resulting sequence is related to a known polypeptide sequence (natural or synthetic), it is preferably modified such that the analog is more lipophilic than the known peptide. Examples of such peptides include, without limitation, Ala-Pro-Gly, Ile-Leu, Ala-Val-Gly-Val-Ala-Pro-Gly (SEQ ID NO: 7) and Ala-Val-Gly-Val-Ala-Pro-Gly-Leu (SEQ ID NO: 8).

[0065] Derivatives of polypeptides in accordance with the present invention include derivatives of the substituted and rearranged polypeptides described herein. These derivatives include, *inter alia*, acyl-derivatives, which are polypeptides, preferably hexapeptides, substituted with one or more straight-chain or branched-chain, long or short chain, saturated or unsaturated acyl groups having from 1 to 29 carbon atoms. N-acyl-derivatives include those acyl groups which can be derived from acetic acid, capric acid, lauric acid, myristic acid, octanoic acid, palmitic acid, stearic acid, behenic acid, linoleic acid, linolenic acid, oleic acid, isostearic acid, elaidic acid, 2-ethylhexanoic acid, coconut oil fatty acid, tallow fatty acid, hardened tallow fatty acid, palm kernel oil fatty acid, lanolin fatty acid and the like. Preferable examples of the acyl group include an acetyl group,

a palmitoyl group, an elaidoyl group, a myristyl group, a biotinyl group and an octanoyl group.

[0066] The following peptides represent a non limiting selection of analogs and derivatives of polypeptides of 6 or more amino acids in length with conservative substitutions: Acetyl-Leu-Gly-Val-Ala-Pro-Ala (SEQ ID NO: 9), Oleoyl-Val-Gly-Leu-Gly-Pro-Gly (SEQ ID NO: 10), Stearoyl-Ile-Ala-Ile-Ala-Pro-Gly (SEQ ID NO: 11), Elaidoyl-Val-Gly-Val-Ala-Pro-Gly (SEQ ID NO: 1), Palmitoyl-Ala-Val-Gly-Val-Ala-Pro-Gly (SEQ ID NO: 7), Acetyl-Ile-Ala-Val-Val-Gly-Ala-Pro-Gly-Ala (SEQ ID NO: 12) and Lipoyl-Leu-Gly-Leu-Ala-Pro-Leu (SEQ ID NO: 6). Preferred embodiments include N-acyl-Val-Gly-Val-Ala-Pro-Gly (SEQ ID NO: 1) peptides, most preferably Palmitoyl-Val-Gly-Val-Ala-Pro-Gly (SEQ ID NO: 1).

[0067] Preferred commercially available hexapeptide derivative-containing compositions are BIOBUSTYL and BIOPEPTIDE EL, commercially available from SEDERMA, France, which contain between 10 and 500 ppm of palmitoyl-Val-Gly-Val-Ala-Pro-Gly (SEQ ID NO: 1) and other ingredients, such an excipient. DERMAXYL, another product which will be available before publication, may also be used and it contains about 200 ppm (w/w) (0.002% w/w) Pal-Val-Gly-Val-Ala-Pro-Gly (SEQ ID NO: 1) and about 4% (w/w) of ceramide 2 in an oil soluble base. Ceramide 2 is available commercially in a product named CERAMIDE 2, which is 100% N-stearoylsphinganine, also known as N-stearoyl-dihydrosphingosine. These may be used to produce compositions of the present invention.

[0068] In one preferred aspect of the present invention, there is provided a composition which can include nothing more than a mixture of at least one molecule including a sequence of six to 12 amino acids, at least two of said amino acids being selected from Gly, Val and Pro and at least one of said amino acids being Pro, and at least one molecule of the chemical class of ceramides. Preferentially at least one of said amino acids is substituted with an acyl group.

[0069] More preferred are combinations of such mixtures with at least one additional ingredient. These mixtures can be combined with any of the additional ingredients described herein in the amounts described herein in connection with hexapeptides.

[0070] More preferably, the molecule including a sequence of six amino acids includes both Pro and Val and even more preferably at least one of the molecules including a sequence of six amino acids includes an amino acid that is substituted with an acyl group. The acyl group is preferably bound to the N-terminal end of at least one amino acid and is a straight-chain or branched-chain, long or short chain, saturated or unsaturated acyl group, which can be derived from acetic acid, biotinic acid, capric acid, lauric acid, myristic acid, octanoic acid, palmitic acid, stearic acid, behenic acid, linoleic acid, linolenic acid, oleic acid, isostearic acid, elaidic acid, 2-ethylhexanoic acid, coconut oil fatty acid, tallow fatty acid, hardened tallow fatty acid, palm kernel oil fatty acid, lanolin fatty acid or mixtures thereof.

[0071] Additional Ingredients

[0072] In addition to the ceramides and polypeptides, analogs and/or derivatives thereof, and in particular, hexapeptides, analogs and derivatives thereof described herein, the compositions of the invention may include various other and additional ingredients, which may be active, functional, conventionally used in cosmetic, personal care or topical/transdermal pharmaceutical products or otherwise. Of course, a decision to include an additional ingredient and the choice of specific additional ingredients depends on the specific application and product formulation. Also, the line of demarcation between an "active" ingredient and an "inactive ingredient" is artificial and dependent on the specific application and product type. A substance that is an "active" ingredient in one application or product may be a "functional" ingredient in another, and vice versa. A particular ingredient might provide substantivity in one formulation,

facilitate transdermal application in another, and merely provide proper viscosity in a third. Which of these is functional and which is active is subject to debate. But, regardless of the outcome, the material in question would qualify as an additional ingredient in accordance with the present invention.

[0073] Thus, the compositions of the invention may include one or more additional ingredients, which provide some benefit to the object of the composition. Such additional ingredients may include one or more substances such as, without limitations, cleaning agents, hair conditioning agents, skin conditioning agents, hair styling agents, antidandruff agents, hair growth promoters, perfumes, sunscreen and/or sunblock compounds for hair and/or skin, pigments, moisturizers, film formers, hair colors, make-up agents, detergents, pharmaceuticals, thickening agents, emulsifiers, humectants, emollients, antiseptic agents, deodorant actives, dermatologically acceptable carriers and surfactants.

[0074] The compositions of the present invention generally contain at least one additional ingredient. The compositions of the present invention may contain a plurality of additional ingredients as well. Usually these compositions include at least one dermatologically acceptable carrier.

[0075] In a preferred embodiment, where the composition is to be in contact with human keratinous tissue, the additional ingredients should be suitable for application to keratinous tissue, that is, when incorporated into the composition they are suitable for use in contact with human keratinous tissue (hair, nails, skin, lips) without undue toxicity, incompatibility, instability, allergic response, and the like within the scope of sound medical judgment. The *CTFA Cosmetic Ingredient Handbook*, Ninth Edition (2002) describes a wide variety of nonlimiting cosmetic and pharmaceutical ingredients commonly used in the skin care industry, which are suitable for use as additional ingredients in the compositions of the present invention. Non-limiting examples of these additional

ingredient classes include: abrasives, absorbents, aesthetic components such as fragrances, pigments, colorings/colorants, essential oils, skin sensates, astringents, etc. (e.g., clove oil, menthol, camphor, eucalyptus oil, eugenol, menthyl lactate, witch hazel distillate), anti-acne agents, anti-caking agents, antifoaming agents, antimicrobial agents (e.g., iodopropyl butylcarbamate), antioxidants, binders, biological additives, buffering agents, bulking agents, chelating agents, chemical additives, colorants, cosmetic astringents, cosmetic biocides, denaturants, drug astringents, external analgesics, film formers or materials, e.g., polymers, for aiding the film-forming properties and substantivity of the composition (e.g., copolymer of eicosene and vinyl pyrrolidone), opacifying agents, pH adjusters, propellants, reducing agents, sequestrants, skin bleaching and lightening agents (e.g., hydroquinone, kojic acid, ascorbic acid, magnesium ascorbyl phosphate, ascorbyl glucosamine), skin-conditioning agents (e.g., humectants, including miscellaneous and occlusive), skin soothing and/or healing agents (e.g., panthenol and derivatives (e.g., ethyl panthenol), aloe vera, pantothenic acid and its derivatives, allantoin, bisabolol, and dipotassium glycyrrhizinate), skin treating agents, thickeners, and vitamins and derivatives thereof. More particularly, additional ingredients include a glycerol, a sorbitol, a pentaerythritol, a pyrrolidone acid and its salts, dihydroxyacetone, erythrulose, glyceraldehyde, tartaraldehyde, a colorant; a water-soluble sunscreen; an antiperspirant, a deodorant, an astringent, a keratolytic, a depilatory, perfumed water, plant tissue extract, a polysaccharide; an anti-dandruff agent; an antiseborrheic agent, an oxidant, a bleaching agent, a reducing agent, a vitamin, a steroid, a hormone, an enzyme, a vaccine, a steroidal or non-steroidal anti-inflammatory, an antibiotic, an antimicrobial, an antibactericidal, a cytotoxic, an antineoplastic agent, fat-soluble active substances selected from the group formed by the fat-soluble sunscreens, substances intended to improve the

state of dry or aged skin, tocopherols, vitamins E, F or A and their esters, retinoic acid, antioxidants, essential fatty acids, glycyrrhetic acid, keratolytics and carotenoids, ceramides and pseudo-ceramides, and all lipid complexes of a form similar to that of the natural ceramides of the skin

[0076] In any embodiment of the present invention, however, the additional ingredients useful herein can be categorized by the benefit they provide or by their postulated mode of action. However, it is to be understood that the additional ingredients useful herein can in some instances provide more than one benefit or operate via more than one mode of action. Therefore, classifications herein are made for the sake of convenience and are not intended to limit the additional ingredients to that particular application or applications listed.

[0077] Farnesol

[0078] The topical compositions of the present invention may contain a safe and effective amount of farnesol. Farnesol is a naturally occurring substance which is believed to act as a precursor and/or intermediate in the biosynthesis of squalene and sterols, especially cholesterol. Farnesol is also involved in protein modification and regulation (e.g., farnesylation of proteins), and there is a cell nuclear receptor which is responsive to farnesol.

[0079] Chemically, farnesol is [2E,6E]-3,7,11-trimethyl-2,6,10-dodecatrien-1-ol and as used herein "farnesol" includes isomers and tautomers of such. Farnesol is commercially available, e.g., under the names farnesol (a mixture of isomers from Dragoco, 10 Gordon Drive, Totowa, NJ) and trans-trans-farnesol (Sigma Chemical Company, P.O. Box 14508, St. Louis, MO).

[0080] When present in the compositions of the present invention, the composition preferably contains from about 0.001% to about 50%, by weight of the composition, more preferably from about 0.01% to about 20%, even more preferably from about 0.1% to about 15%, even more preferably from about

0.1% to about 10%, still more preferably from about 0.5% to about 5%, and still more preferably from about 1% to about 5% of farnesol.

[0081] Phytantriol

[0082] The topical compositions of the present invention may contain a safe and effective amount of phytantriol. Phytantriol is the common name for the chemical known as 3,7,11,15, tetramethylhexadecane-1,2,3, -triol. Phytantriol is commercially available from BASF (1609 Biddle Avenue, Wyandotte, MI). For example, phytantriol is useful as a spider vessel/red blotchiness repair agent, a dark circle/puffy eye repair agent, sallowness repair agent, a sagging repair agent, an anti-itch agent, a skin thickening agent, a pore reduction agent, oil/shine reduction agent, a post-inflammatory hyperpigmentation repair agent, wound treating agent, an anti-cellulite agent, and regulating skin texture, including wrinkles and fine lines.

[0083] In the compositions of the present invention, the phytantriol preferably is included in an amount from about 0.001% to about 50% by weight of the composition, more preferably from about 0.01% to about 20%, even more preferably from about 0.1% to about 15%, even more preferably from about 0.2% to about 10%, still more preferably from about 0.5% to about 10%, and still more preferably from about 1% to about 5%.

[0084] Desquamation Actives

[0085] A safe and effective amount of a desquamation active may be added to the compositions of the present invention, more preferably from about 0.1% to about 10%, even more preferably from about 0.2% to about 5%, also preferably from about 0.5% to about 4%, by weight of the composition. Desquamation actives enhance the skin appearance benefits of the present invention. For example, the desquamation actives tend to improve the texture of the skin (e.g., smoothness). One desquamation system that is suitable for use herein contains sulfhydryl compounds and zwitterionic surfactants and

is described in U.S. Pat. No. 5,681,852, to Bissett, incorporated herein by reference. Another desquamation system that is suitable for use herein contains salicylic acid and zwitterionic surfactants and is described in U.S. Pat. No. 5,652,228 to Bissett, incorporated herein by reference. Zwitterionic surfactants such as described in these applications are also useful as desquamatory agents herein, with cetyl betaine being particularly preferred.

[0086] Anti-Acne Actives

[0087] The compositions of the present invention may contain a safe and effective amount of one or more anti-acne actives. Examples of useful anti-acne actives include resorcinol, sulfur, salicylic acid, benzoyl peroxide, erythromycin, zinc, etc. Further examples of suitable anti-acne actives are described in further detail in U.S. Pat. No. 5,607,980, issued to McAtee et al., on March 4, 1997. Especially useful are combinations with the anti-acne ingredient called "ac.net" offered by SEDERMA and described in WO 03/028692 A2 of April 10, 2003.

[0088] Anti-Wrinkle Actives/Anti-Atrophy Actives

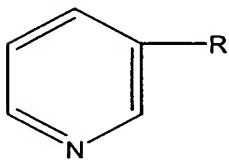
[0089] The compositions of the present invention may further contain a safe and effective amount of one or more anti-wrinkle actives or anti-atrophy actives. Exemplary anti-wrinkle/anti-atrophy actives suitable for use in the compositions of the present invention include sulfur-containing D and L amino acids and their derivatives and salts, particularly the N-acetyl derivatives, a preferred example of which is N-acetyl-L-cysteine; thiols, e.g. ethane thiol; hydroxy acids (e.g., alpha-hydroxy acids such as lactic acid and glycolic acid or beta-hydroxy acids such as salicylic acid and salicylic acid derivatives such as the octanoyl derivative), phytic acid, lipoic acid; lysophosphatidic acid, skin peel agents (e.g., phenol and the like), vitamin B₃ compounds and retinoids which enhance the keratinous tissue appearance benefits of the present invention, especially in regulating keratinous tissue condition, e.g., skin condition.

Especially useful are combinations with the wrinkle agents called Dermolectine and Sterocare offered by SEDERMA, the latter described in WO99 / 18927 of April 22, 1999

[0090] a) Vitamin B₃ Compounds

[0091] The compositions of the present invention may contain a safe and effective amount of a vitamin B₃ compound. Vitamin B₃ compounds are particularly useful for regulating skin condition as described in co-pending U.S. application Ser. No. 08/834,010, filed April 11, 1997 (corresponding to international publication WO 97/39733 A1, published October 30, 1997). When vitamin B₃ compounds are present in the compositions of the instant invention, the compositions preferably contain from about 0.01% to about 50%, more preferably from about 0.1% to about 10%, even more preferably from about 0.5% to about 10%, and still more preferably from about 1% to about 5%, still more preferably from about 2% to about 5%, by weight of the composition, of the vitamin B₃ compound.

[0092] As used herein, "vitamin B₃ compound" means a compound having the formula:



, wherein R is —CONH₂ (i.e., niacinamide), —COOH (i.e., nicotinic acid) or —CH₂OH (i.e., nicotinyl alcohol); derivatives thereof; and salts of any of the foregoing.

[0093] Exemplary derivatives of the foregoing vitamin B₃ compounds include nicotinic acid esters, including non-vasodilating esters of nicotinic acid (e.g., tocopheryl nicotinate), nicotinyl amino acids, nicotinyl alcohol esters of carboxylic acids, nicotinic acid N-oxide and niacinamide N-oxide.

[0094] Examples of suitable vitamin B₃ compounds are well known in the art and are commercially available from a number of sources, e.g., the Sigma Chemical Company (St. Louis, MO);

ICN Biomedicals, Inc. (Irvine, CA) and Aldrich Chemical Company (Milwaukee, WI).

[0095] The vitamin compounds may be included as the substantially pure material, or as an extract obtained by suitable physical and/or chemical isolation from natural (e.g., plant) sources.

[0096] b) Retinoids

[0097] The compositions of the present invention may also contain a retinoid. As used herein, "retinoid" includes all natural and/or synthetic analogs of Vitamin A or retinol-like compounds which possess the biological activity of Vitamin A in the skin as well as the geometric isomers and stereoisomers of these compounds. The retinoid is preferably retinol, retinol esters (e.g., C₂-C₂₂ alkyl esters of retinol, including retinyl palmitate, retinyl acetate, retinyl propionate), retinal, and/or retinoic acid (including all-trans retinoic acid and/or 13-cis-retinoic acid), more preferably retinoids other than retinoic acid. These compounds are well known in the art and are commercially available from a number of sources, e.g., Sigma Chemical Company (St. Louis, MO), and Boehringer Mannheim (Indianapolis, IN). Other retinoids which are useful herein are described in U.S. Pat. Nos. 4,677,120, issued June 30, 1987 to Parish et al.; U.S. Pat. No. 4,885,311, issued December 5, 1989 to Parish et al.; U.S. Pat. No. 5,049,584, issued September 17, 1991 to Purcell et al.; U.S. Pat. No. 5,124,356, issued June 23, 1992 to Purcell et al.; and U.S. Pat. No. Reissue 34,075, issued September 22, 1992 to Purcell et al. Other suitable retinoids are tocopheryl-retinoate [tocopherol ester of retinoic acid (trans- or cis-), adapalene {6-[3-(1-adamantyl)-4-methoxyphenyl]-2-naphthoic acid}, and tazarotene (ethyl 6-[2-(4,4-dimethylthiochroman-6-yl)-ethynyl]nicotinate). Preferred retinoids are retinol, retinyl palmitate, retinyl acetate, retinyl propionate, retinal and combinations thereof.

[0098] The retinoid may be included as the substantially pure material, or as an extract obtained by suitable physical

and/or chemical isolation from natural (e.g., plant) sources. The retinoid is preferably substantially pure, more preferably essentially pure.

[0099] The compositions of this invention may contain a safe and effective amount of the retinoid, such that the resultant composition is safe and effective for regulating keratinous tissue condition, preferably for regulating visible and/or tactile discontinuities in skin, more preferably for regulating signs of skin aging, even more preferably for regulating visible and/or tactile discontinuities in skin texture associated with skin aging. The compositions preferably contain from or about 0.005% to or about 2%, more preferably 0.01% to or about 2%, retinoid. Retinol is preferably used in an amount of from or about 0.01% to or about 0.15%; retinol esters are preferably used in an amount of from or about 0.01% to or about 2% (e.g., about 1%); retinoic acids are preferably used in an amount of from or about 0.01% to or about 0.25%; tocopheryl-retinoate, adapalene, and tazarotene are preferably used in an amount of from or about 0.01% to or about 2%.

[0100] Where the compositions of the present invention contain both a retinoid and a Vitamin B₃ compound, the retinoid is preferably used in the above amounts, and the vitamin B₃ compound is preferably used in an amount of from or about 0.1% to or about 10%, more preferably from or about 2% to or about 5%.

[0101] c) Hydroxy Acids

[0102] The compositions of the present invention may contain a safe and effective amount of a hydroxy acid. Preferred hydroxy acids for use in the compositions of the present invention include salicylic acid and salicylic acid derivatives. When present in the compositions of the present invention, salicylic acid is preferably used in an amount of from about 0.01% to about 50%, more preferably from about 0.1% to about 20%, even more preferably from about 0.1% to about

10%, still more preferably from about 0.5% to about 5%, and still more preferably from about 0.5% to about 2%.

[0103] Anti-Oxidants/Radical Scavengers

[0104] The compositions of the present invention may include a safe and effective amount of an anti-oxidant/radical scavenger or an oxidizer/reducing agent. The anti-oxidant/radical scavenger or oxidizer/reducing agent is especially useful for providing protection against UV radiation which can cause increased scaling or texture changes in the stratum corneum and against other environmental agents which can cause skin damage. These compounds may also be useful in hair drying and other cosmetic applications.

[0105] A safe and effective amount of an anti-oxidant/radical scavenger or an oxidizer/reducing agent may be added to the compositions of the subject invention, preferably from about 0.1% to about 10%, more preferably from about 1% to about 5%, of the composition.

[0106] Anti-oxidants/radical scavengers such as ascorbic acid (vitamin C) and its salts, ascorbyl esters of fatty acids, ascorbic acid derivatives (e.g., magnesium ascorbyl phosphate, sodium ascorbyl phosphate, ascorbyl sorbate), tocopherol (vitamin E), tocopherol sorbate, tocopherol acetate, other esters of tocopherol, butylated hydroxy benzoic acids and their salts, peroxides including hydrogen peroxide, perborate, thioglycolates, persulfate salts, 6-hydroxy-2,5,7,8-tetramethylchroman-2-carboxylic acid (commercially available under the trade name Trolox®), gallic acid and its alkyl esters, especially propyl gallate, uric acid and its salts and alkyl esters, sorbic acid and its salts, lipoic acid, amines (e.g., N,N-diethylhydroxylamine, amino-guanidine), sulfhydryl compounds (e.g., glutathione), dihydroxy fumaric acid and its salts, lysine pidolate, arginine pilolate, nordihydroguaiaretic acid, bioflavonoids, curcumin, lysine, 1-methionine, proline, superoxide dismutase, silymarin, tea extracts, grape skin/seed extracts, melanin, and rosemary extracts may be used. Preferred anti-

oxidants/radical scavengers are selected from tocopherol sorbate and other esters of tocopherol, more preferably tocopherol sorbate. For example, the use of tocopherol sorbate in topical compositions and applicable to the present invention is described in U.S. Pat. No. 4,847,071, issued on Jul. 11, 1989 to Donald L. Bissett, Rodney D. Bush and Ranjit Chatterjee. Especially useful are combinations with the antioxidant enzymes called VENUCEANE® offered by SEDERMA, described in PCT/FR 0200488 OF February 7, 2002.

[0107] Chelators

[0108] The compositions of the present invention may also contain a safe and effective amount of a chelator or chelating agent. As used herein, "chelator" or "chelating agent" means an active agent capable of removing a metal ion from a system by forming a complex so that the metal ion cannot readily participate in or catalyze chemical reactions. The inclusion of a chelating agent is especially useful for providing protection against UV radiation which can contribute to excessive scaling or skin texture changes and against other environmental agents which can cause skin damage.

[0109] A safe and effective amount of a chelating agent may be added to the compositions of the subject invention, preferably from about 0.1% to about 10%, more preferably from about 1% to about 5%, of the composition. Exemplary chelators that are useful herein are disclosed in U.S. Pat. No. 5,487,884, issued January 30, 1996 to Bissett *et al.*; International Publication No. 91/16035, Bush *et al.*, published October 31, 1995; and International Publication No. 91/16034, Bush *et al.*, published October 31, 1995. Preferred chelators useful in compositions of the subject invention are furildioxime, furilmonoxime, and derivatives thereof.

[0110] Flavonoids

[0111] The compositions of the present invention may optionally contain a flavonoid compound. Flavonoids are broadly disclosed in U.S. Pats. Nos. 5,686,082 and 5,686,367, both of which are herein incorporated by reference. Flavonoids

suitable for use in the present invention are flavanones selected from unsubstituted flavanones, mono-substituted flavanones, and mixtures thereof; chalcones selected from unsubstituted chalcones, mono-substituted chalcones, di-substituted chalcones, tri-substituted chalcones, and mixtures thereof; flavones selected from unsubstituted flavones, mono-substituted flavones, di-substituted flavones, and mixtures thereof; one or more isoflavones; coumarins selected from unsubstituted coumarins, mono-substituted coumarins, di-substituted coumarins, and mixtures thereof; chromones selected from unsubstituted chromones, mono-substituted chromones, di-substituted chromones, and mixtures thereof; one or more dicoumarols; one or more chromanones; one or more chromanols; isomers (e.g., cis/trans isomers) thereof; and mixtures thereof. By the term "substituted" as used herein means flavonoids wherein one or more hydrogen atom of the flavonoid has been independently replaced with hydroxyl, C1-C8 alkyl, C1-C4 alkoxy, O-glycoside, and the like or a mixture of these substituents.

[0112] Examples of suitable flavonoids include, but are not limited to, unsubstituted flavanone, mono-hydroxy flavanones (e.g., 2'-hydroxy flavanone, 6-hydroxy flavanone, 7-hydroxy flavanone, etc.), mono-alkoxy flavanones (e.g., 5-methoxy flavanone, 6-methoxy flavanone, 7-methoxy flavanone, 4'-methoxy flavanone, etc.), unsubstituted chalcone (especially unsubstituted trans-chalcone), mono-hydroxy chalcones (e.g., 2'-hydroxy chalcone, 4'-hydroxy chalcone, etc.), di-hydroxy chalcones (e.g., 2',4'-dihydroxy chalcone, 2',4'-dihydroxy chalcone, 2,2'-dihydroxy chalcone, 2',3'-dihydroxy chalcone, 2',5'-dihydroxy chalcone, etc.), and tri-hydroxy chalcones (e.g., 2',3',4'-trihydroxy chalcone, 4,2',4'-trihydroxy chalcone, 2,2',4'-trihydroxy chalcone, etc.), unsubstituted flavone, 7,2'-dihydroxy flavone, 3',4'-dihydroxy naphthoflavone, 4'-hydroxy flavone, 5,6-benzoflavone, and 7,8-benzoflavone, unsubstituted isoflavone, daidzein (7,4'-dihydroxy isoflavone), 5,7-dihydroxy-4'-methoxy isoflavone,

soy isoflavones (a mixture extracted from soy), unsubstituted coumarin, 4-hydroxy coumarin, 7-hydroxy coumarin, 6-hydroxy-4-methyl coumarin, unsubstituted chromone, 3-formyl chromone, 3-formyl-6-isopropyl chromone, unsubstituted dicoumarol, unsubstituted chromanone, unsubstituted chromanol, and mixtures thereof.

[0113] Preferred for use herein are unsubstituted flavanone, methoxy flavanones, unsubstituted chalcone, 2',4-dihydroxy chalcone, and mixtures thereof. More preferred are unsubstituted flavanone, unsubstituted chalcone (especially the trans isomer), and mixtures thereof.

[0114] They can be synthetic materials or obtained as extracts from natural sources (e.g., plants). The naturally sourced material can also further be derivatized (e.g., an ester or ether derivative prepared following extraction from a natural source). Flavonoid compounds useful herein are commercially available from a number of sources, e.g., Indofine Chemical Company, Inc. (Somerville, NJ), Steraloids, Inc. (Wilton, NH), and Aldrich Chemical Company, Inc. (Milwaukee, WI).

[0115] Mixtures of the above flavonoid compounds may also be used.

[0116] The herein described flavonoid compounds are preferably present in the instant invention at concentrations of from about 0.01% to about 20%, more preferably from about 0.1% to about 10% , and still more preferably from about 0.5% to about 5%.

[0117] Anti-Inflammatory Agents

[0118] A safe and effective amount of an anti-inflammatory agent may be added to the compositions of the present invention, preferably from about 0.1% to about 10%, more preferably from about 0.5% to about 5%, of the composition. The anti-inflammatory agent enhances the skin appearance benefits of the present invention, e.g., such agents contribute to a more uniform and acceptable skin tone or color. The exact amount of anti-inflammatory agent to be used

in the compositions will depend on the particular anti-inflammatory agent utilized since such agents vary widely in potency.

[0119] Steroidal anti-inflammatory agents, including but not limited to, corticosteroids such as hydrocortisone, hydroxyltriamcinolone, alpha-methyl dexamethasone, dexamethasone-phosphate, beclomethasone dipropionates, clobetasol valerate, desonide, desoxymethasone, desoxycorticosterone acetate, dexamethasone, dichlorisone, diflorasone diacetate, diflucortolone valerate, fluadrenolone, flucolorolone acetonide, fludrocortisone, flumethasone pivalate, fluosinolone acetonide, fluocinonide, flucortine butylesters, flucortolone, fluprednidene (fluprednylidene) acetate, flurandrenolone, halcinonide, hydrocortisone acetate, hydrocortisone butyrate, methylprednisolone, triamcinolone acetonide, cortisone, cortodoxone, flucetonide, fludrocortisone, difluorosone diacetate, fluradrenolone, fludrocortisone, difluorosone diacetate, fluradrenolone acetonide, medrysone, amcinafel, amcinafide, betamethasone and the balance of its esters, chloroprednisone, chlorprednisone acetate, clocortelone, clescinalone, dichlorisone, diflurprednate, flucoloronide, flunisolid, fluoromethalone, fluperolone, fluprednisolone, hydrocortisone valerate, hydrocortisone cyclopentylpropionate, hydrocortamate, meprednisone, paramethasone, prednisolone, prednisone, beclomethasone dipropionate, triamcinolone, and mixtures thereof may be used. The preferred steroidal anti-inflammatory for use is hydrocortisone.

[0120] A second class of anti-inflammatory agents which is useful in the compositions includes the nonsteroidal anti-inflammatory agents. The variety of compounds encompassed by this group are well-known to those skilled in the art. For detailed disclosure of the chemical structure, synthesis, side effects, etc. of non-steroidal anti-inflammatory agents, one may refer to standard texts, including Anti-inflammatory and Anti-Rheumatic Drugs, K. D. Rainsford, Vol. I-III, CRC Press,

Boca Raton, (1985), and Anti-inflammatory Agents, Chemistry and Pharmacology, 1, R. A. Scherrer, et al., Academic Press, NY (1974).

[0121] Specific non-steroidal anti-inflammatory agents useful in the composition invention include, but are not limited to:

- 1) the oxicams, such as piroxicam, isoxicam, tenoxicam, sudoxicam, and CP-14,304;
- 2) the salicylates, such as aspirin, disalcid, benorylate, trilisate, safapryn, solprin, diflunisal, and fendosal;
- 3) the acetic acid derivatives, such as diclofenac, fenclofenac, indomethacin, sulindac, tolmetin, isoxepac, furofenac, tiopinac, zidometacin, acematacin, fentiazac, zomepirac, clindanac, oxepinac, felbinac, and ketorolac;
- 4) the fenamates, such as mefenamic, meclofenamic, flufenamic, niflumic, and tolfenamic acids;
- 5) the propionic acid derivatives, such as ibuprofen, naproxen, benoxaprofen, flurbiprofen, ketoprofen, fenoprofen, fenbufen, indopropfen, pirprofen, carprofen, oxaprozin, pranoprofen, miroprofen, tioxaprofen, suprofen, alminoprofen, and tiaprofenic; and
- 6) the pyrazoles, such as phenylbutazone, oxyphenbutazone, feprazone, azapropazone, and trimethazone.

[0122] Mixtures of these non-steroidal anti-inflammatory agents may also be employed, as well as the dermatologically acceptable salts and esters of these agents. For example, etofenamate, a flufenamic acid derivative, is particularly useful for topical application. Of the nonsteroidal anti-inflammatory agents, ibuprofen, naproxen, flufenamic acid, etofenamate, aspirin, mefenamic acid, meclofenamic acid, piroxicam and felbinac are preferred; ibuprofen, naproxen,

ketoprofen, etofenamate, aspirin and flufenamic acid are more preferred.

[0123] Finally, so-called "natural" anti-inflammatory agents are useful in methods of the present invention. Such agents may suitably be obtained as an extract by suitable physical and/or chemical isolation from natural sources (e.g., plants, fungi, by-products of microorganisms) or can be synthetically prepared. For example, candelilla wax, bisabolol (e.g., alpha bisabolol), aloe vera, plant sterols (e.g., phytosterol), Manjistha (extracted from plants in the genus *Rubia*, particularly *Rubia Cordifolia*), and Guggal (extracted from plants in the genus *Commiphora*, particularly *Commiphora Mukul*), kola extract, chamomile, red clover extract, *Piper methysticum* extract (Kava Kava from SEDERMA, disclosed in FR 2 771 002 of March 31, 2000 and WO 99 / 25369), *Bacopa monieri* extract (Bacocalmine from SEDERMA, disclosed in WO 99 / 40897 of August 19, 1999) and sea whip extract, may be used.

[0124] Additional anti-inflammatory agents useful herein include compounds of the Licorice (the plant genus/species *Glycyrrhiza glabra*) family, including glycyrrhetic acid, glycyrrhizic acid, and derivatives thereof (e.g., salts and esters). Suitable salts of the foregoing compounds include metal and ammonium salts. Suitable esters include C₂-C₂₄ saturated or unsaturated esters of the acids, preferably C₁₀-C₂₄, more preferably C₁₆-C₂₄. Specific examples of the foregoing include oil soluble licorice extract, the glycyrrhizic and glycyrrhetic acids themselves, monoammonium glycyrrhizinate, monopotassium glycyrrhizinate, dipotassium glycyrrhizinate, 1-beta-glycyrrhetic acid, stearyl glycyrrhetinate, and 3-stearyloxy-glycyrrhetinic acid, and disodium 3-succinyloxy-beta-glycyrrhetinate. Stearyl glycyrrhetinate is preferred.

[0125] Anti-Cellulite Agents

[0126] The compositions of the present invention may also contain a safe and effective amount of an anti-cellulite agent. Suitable agents may include, but are not limited to,

xanthine compounds (e.g., caffeine, theophylline, theobromine, and aminophylline). Especially useful are combinations with the cellulite/slimming agents called Vexel (FR 2 654 619 of January 31, 1992), Coaxel (FR2694195 of July 30, 1992), Cyclolipase (FR2 733 149 of April 21, 1995), Pleurimincyl and Lipocare (WO 98 / 43607 of October 08, 1998) and Unislim (FR 0306063 of May 20, 2003) offered by SEDERMA

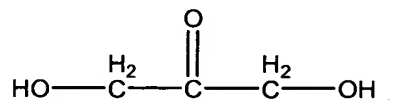
[0127] Topical Anesthetics

[0128] The compositions of the present invention may also contain a safe and effective amount of a topical anesthetic. Examples of topical anesthetic drugs include benzocaine, lidocaine, bupivacaine, chlorprocaine, dibucaine, etidocaine, mepivacaine, tetracaine, dyclonine, hexylcaine, procaine, cocaine, ketamine, pramoxine, phenol, and pharmaceutically acceptable salts thereof.

[0129] Tanning Actives

[0130] The compositions of the present invention may contain a tanning active. When present, it is preferable that the compositions contain from about 0.1% to about 20%, more preferably from about 2% to about 7%, and still more preferably from about 3% to about 6%, by weight of the composition, of dihydroxyacetone as an artificial tanning active.

[0131] Dihydroxyacetone, which is also known as DHA or 1,3-dihydroxy-2-propanone, is a white to off-white, crystalline powder. This material can be represented by the chemical formula $C_3H_6O_3$ and the following chemical structure:



[0132] The compound can exist as a mixture of monomers and dimers, with the dimers predominating in the solid crystalline state. Upon heating or melting, the dimers break down to yield the monomers. This conversion of the dimeric form to the monomeric form also occurs in aqueous solution. Dihydroxyacetone is also known to be more stable at acidic pH

values. See The Merck Index, Tenth Edition, entry 3167, p. 463 (1983), and "Dihydroxyacetone for Cosmetics", E. Merck Technical Bulletin, 03-304 110, 319 897, 180 588. Especially useful are combinations with the tanning agents called Tyr-ol and Tyr-exel offered by SEDERMA and described in Fr 2 702 766 of March 15, 1993 and WO 03/017966 A2 of March 6, 2003, respectively.

[0133] Skin Lightening Agents

[0134] The compositions of the present invention may contain a skin lightening agent. When used, the compositions preferably contain from about 0.1% to about 10%, more preferably from about 0.2% to about 5%, also preferably from about 0.5% to about 2%, by weight of the composition, of a skin lightening agent. Suitable skin lightening agents include those known in the art, including kojic acid, arbutin, ascorbic acid and derivatives thereof (e.g., magnesium ascorbyl phosphate or sodium ascorbyl phosphate), and extracts (e.g., mulberry extract, placental extract). Skin lightening agents suitable for use herein also include hydroquinone and those described in the PCT publication No. 95/34280, in the name of Hillebrand, corresponding to PCT Appln. No. U.S. Ser. No. 95/07432, filed June 12, 1995; and co-pending U.S. application Ser. No. 08/390,152 filed in the names of Kvalnes, Mitchell A. DeLong, Barton J. Bradbury, Curtis B. Motley, and John D. Carter, corresponding to PCT Publication Ser. No. 95/23780, published 9/8/95. Especially useful are combinations with the skin lightening agents called Melaclear, Etioline, Melaslow and Lumiskin offered by SEDERMA and described respectively in FR 2 732 215 of March 28, 1995, WO 98/05299 of August 2, 1996; WO 02/15871 of February 28, 2002 and PCT/FR 03/02400 of August 30, 2002.

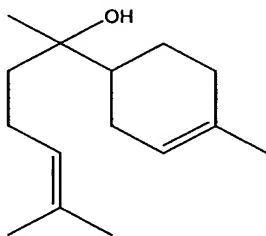
[0135] Skin Soothing and Skin Healing Actives

[0136] The compositions of the present invention may comprise a skin soothing or skin healing active. Skin soothing or skin healing actives suitable for use herein include panthenoic acid derivatives (including panthenol,

dexpanthenol, ethyl panthenol), aloe vera, allantoin, bisabolol, and dipotassium glycyrrhizinate. A safe and effective amount of a skin soothing or skin healing active may be added to the present composition, preferably, from about 0.1% to about 30%, more preferably from about 0.5% to about 20%, still more preferably from about 0.5% to about 10 %, by weight of the composition formed. Especially useful are combinations with the skin soothing and healing agents called Calmosensine and Bacocalmine offered by SEDERMA and described in WO 98 / 07744 of February 26, 1998 and WO 99 / 40897 of August 19, 1999 respectively.

[0137] Bisabolol

[0138] The topical compositions of the present invention may also contain a safe and effective amount of bisabolol. Bisabolol is a naturally occurring unsaturated monocyclic terpene alcohol having the following structure:



[0139] It is the primary active component of chamomile extract/oil. Bisabolol can be synthetic (d,l-alpha-isomer or (+/-)-alpha-isomer) or natural ((-)-alpha-isomer) in origin and can be used as essentially pure compounds or mixtures of compounds (e.g., extracts from natural sources such as chamomile). The alpha form of bisabolol (a-bisabolol) is used in a variety of cosmetic products as a skin conditioning or soothing agent. As used herein, "bisabolol" includes chamomile extract or oil and any isomers and tautomers of such. Suitable bisabolol compounds are commercially available as a natural material from Dragoco (Totowa, NJ) under the product name alpha-bisabolol natural and as a synthetic material from Fluka (Milwaukee, WI) under the product name alpha-bisabolol.

[0140] In the compositions of the present invention, the composition preferably contains from about 0.001% to about 50%, by weight of the composition, more preferably from about 0.01% to about 20%, even more preferably from about 0.01% to about 15%, and still more preferably from about 0.1% to about 10%, of bisabolol, even more preferably from about 0.1% to about 5%.

[0141] Antimicrobial and Antifungal Actives

[0142] The compositions of the present invention may contain an antimicrobial or antifungal active. Such actives are capable of destroying microbes, preventing the development of microbes or preventing the pathogenic action of microbes. A safe and effective amount of an antimicrobial or antifungal active may be added to the present compositions, preferably, from about 0.001% to about 10%, more preferably from about 0.01% to about 5%, and still more preferably from about 0.05% to about 2%.

[0143] Examples of antimicrobial and antifungal actives include β -lactam drugs, quinolone drugs, ciprofloxacin, norfloxacin, tetracycline, erythromycin, amikacin, 2,4,4'-trichloro-2'-hydroxy diphenyl ether, 3,4,4'-trichlorobanilide, phenoxyethanol, phenoxy propanol, phenoxyisopropanol, doxycycline, capreomycin, chlorhexidine, chlortetracycline, oxytetracycline, clindamycin, ethambutol, hexamidine isethionate, metronidazole, pentamidine, gentamicin, kanamycin, lineomycin, methacycline, methenamine, minocycline, neomycin, netilmicin, paromomycin, streptomycin, tobramycin, miconazole, tetracycline hydrochloride, erythromycin, zinc erythromycin, erythromycin estolate, erythromycin stearate, amikacin sulfate, doxycycline hydrochloride, capreomycin sulfate, chlorhexidine gluconate, chlorhexidine hydrochloride, chlortetracycline hydrochloride, oxytetracycline hydrochloride, clindamycin hydrochloride, ethambutol hydrochloride, metronidazole hydrochloride, pentamidine hydrochloride, gentamicin sulfate, kanamycin sulfate, lineomycin hydrochloride, methacycline hydrochloride,

methenamine hippurate, methenamine mandelate, minocycline hydrochloride, neomycin sulfate, netilmicin sulfate, paromomycin sulfate, streptomycin sulfate, tobramycin sulfate, miconazole hydrochloride, ketaconazole, amanfadin hydrochloride, amanfadin sulfate, octopirox, parachlorometa xylenol, nystatin, tolinaftate, zinc pyrithione and clotrimazole. Especially useful are combinations with the ingredient range called OSMOCIDE offered by SEDERMA and described in WO 97/05856 of February 20, 1997.

[0144] Preferred examples of actives useful herein include those selected from salicylic acid, benzoyl peroxide, 3-hydroxy benzoic acid, glycolic acid, lactic acid, 4-hydroxy benzoic acid, acetyl salicylic acid, 2-hydroxybutanoic acid, 2-hydroxypentanoic acid, 2-hydroxyhexanoic acid, cis-retinoic acid, trans-retinoic acid, retinol, phytic acid, N-acetyl-L-cysteine, lipoic acid, azelaic acid, arachidonic acid, benzoylperoxide, tetracycline, ibuprofen, naproxen, hydrocortisone, acetaminophen, resorcinol, phenoxyethanol, phenoxypropanol, phenoxyisopropanol, 2,4,4'-trichloro-2'-hydroxy diphenyl ether, 3,4,4'-trichlorocarbanilide, octopirox, lidocaine hydrochloride, clotrimazole, miconazole, ketoconazole, neocycin sulfate, and mixtures thereof.

[0145] Sunscreen Actives

[0146] Exposure to ultraviolet light can result in excessive scaling and texture changes of the stratum corneum. Therefore, the compositions of the subject invention may optionally contain a sunscreen active. As used herein, "sunscreen active" includes both sunscreen agents and physical sunblocks. Suitable sunscreen actives may be organic or inorganic.

[0147] Inorganic sunscreens useful herein include the following metallic oxides; titanium dioxide having an average primary particle size of from about 15 nm to about 100 nm, zinc oxide having an average primary particle size of from about 15 nm to about 150 nm, zirconium oxide having an average primary particle size of from about 15 nm to about 150 nm,

iron oxide having an average primary particle size of from about 15 nm to about 500nm, and mixtures thereof. When used herein, the inorganic sunscreens are present in the amount of from about 0.1% to about 20%, preferably from about 0.5% to about 10%, more preferably from about 1% to about 5%, by weight of the composition.

[0148] A wide variety of conventional organic sunscreen actives are suitable for use herein. Sagarin, et al., at Chapter VIII, pages 189 et seq., of *Cosmetics Science and Technology* (1972), discloses numerous suitable actives. Specific suitable sunscreen actives include, for example: p-aminobenzoic acid, its salts and its derivatives (ethyl, isobutyl, glyceryl esters; p-dimethylaminobenzoic acid); anthranilates (i.e., o-amino-benzoates; methyl, menthyl, phenyl, benzyl, phenylethyl, linalyl, terpinyl, and cyclohexenyl esters); salicylates (amyl, phenyl, octyl, benzyl, menthyl, glyceryl, and di-pro-pyleneglycol esters); cinnamic acid derivatives (menthyl and benzyl esters, a-phenyl cinnamionitrile; butyl cinnamoyl pyruvate); dihydroxycinnamic acid derivatives (umbelliferone, methylumbelliferone, methylaceto-umbelliferone); trihydroxy-cinnamic acid derivatives (esculetin, methylesculetin, daphnetin, and the glucosides, esculin and daphnin); hydrocarbons (diphenylbutadiene, stilbene); dibenzalacetone and benzalacetophenone; naphtholsulfonates (sodium salts of 2-naphthol-3,6-disulfonic and of 2-naphthol-6,8-disulfonic acids); di-hydroxynaphthoic acid and its salts; o- and p-hydroxybiphenyldisulfonates; coumarin derivatives (7-hydroxy, 7-methyl, 3-phenyl); diazoles (2-acetyl-3-bromoindazole, phenyl benzoxazole, methyl naphthoxazole, various aryl benzothiazoles); quinine salts (bisulfate, sulfate, chloride, oleate, and tannate); quinoline derivatives (8-hydroxyquinoline salts, 2-phenylquinoline); hydroxy- or methoxy-substituted benzophenones; uric and violuric acids; tannic acid and its derivatives (e.g., hexaethylether); (butyl carbotol) (6-propyl piperonyl) ether; hydroquinone;

benzophenones (oxybenzene, sulisobenzene, dioxybenzene, benzoescorcinol, 2,2',4,4'-tetrahydroxybenzophenone, 2,2'-dihydroxy-4,4'-dimethoxybenzophenone, octabenzene; 4-isopropylidibenzoylmethane; butylmethoxydibenzoylmethane; etocrylene; octocrylene; [3-(4'-methylbenzylidene boman-2-one), terephthalylidene dicamphor sulfonic acid and 4-isopropyl-di-benzoylmethane.

[0149] Of these, 2-ethylhexyl-p-methoxycinnamate (commercially available as PARSOL MCX), 4,4'-t-butyl methoxydibenzoyl-methane (commercially available as PARSOL 1789), 2-hydroxy-4-methoxybenzophenone, octyldimethyl-p-aminobenzoic acid, digalloyltrioleate, 2,2-dihydroxy-4-methoxybenzophenone, ethyl-4-(bis(hydroxypropyl))aminobenzoate, 2-ethylhexyl-2-cyano-3,3-diphenylacrylate, 2-ethylhexyl-salicylate, glyceryl-p-aminobenzoate, 3,3,5-tri-methylcyclohexylsalicylate, methylanthranilate, p-dimethyl-aminobenzoic acid or aminobenzoate, 2-ethylhexyl-p-dimethyl-amino-benzoate, 2-phenylbenzimidazole-5-sulfonic acid, 2-(p-dimethylaminophenyl)-5-sulfonicbenzoxazoic acid, octocrylene and mixtures of these compounds, are preferred.

[0150] Also preferred are the compositions and combinations described and claimed in U.S. Patent No. 6,190,645 to SaNogueira et al. and in particular, sunscreen agents disclosed at col. 3, lns. 4-23, in combination with a cinnamido alkyl amine cationic quaternary salt such as cinnamidopropyl trimethyl ammonium chloride sold under the trademark INCROQUAT-UV-283 manufactured by Croda, Inc., 7 Century Road, Parsippany, NJ. These portions of the 6,190,645 patent are hereby incorporated by reference. More preferred organic sunscreen actives useful in the compositions useful in the subject invention are 2-ethylhexyl-p-methoxycinnamate, butylmethoxydibenzoyl-methane, 2-hydroxy-4-methoxybenzo-phenone, 2-phenylbenzimidazole-5-sulfonic acid, octyldimethyl-p-aminobenzoic acid, octocrylene and mixtures thereof.

[0151] Also particularly useful in the compositions are sunscreen actives such as those disclosed in U.S. Pat. No. 4,937,370 issued to Sabatelli on June 26, 1990, and U.S. Pat. No. 4,999,186 issued to Sabatelli & Spirnak on March 12, 1991. The sunscreens disclosed therein have, in a single molecule, two distinct chromophore moieties which exhibit different ultra-violet radiation absorption spectra. One of the chromophore moieties absorbs predominantly in the UVB radiation range and the other absorbs strongly in the UVA radiation range.

[0152] Preferred members of this class of sunscreens are 4-N,N-(2-ethylhexyl)methyl-aminobenzoic acid ester of 2,4-dihydroxybenzophenone; N,N-di-(2-ethylhexyl)-4-aminobenzoic acid ester with 4-hydroxydibenzoylmethane; 4-N,N-(2-ethylhexyl)methyl-aminobenzoic acid ester with 4-hydroxydibenzoylmethane; 4-N,N-(2-ethylhexyl)methyl-aminobenzoic acid ester of 2-hydroxy-4-(2-hydroxyethoxy)benzophenone; 4-N,N-(2-ethylhexyl)-methylaminobenzoic acid ester of 4-(2-hydroxyethoxy)dibenzoylmethane; N,N-di-(2-ethylhexyl)-4-aminobenzoic acid ester of 2-hydroxy-4-(2-hydroxyethoxy)benzophenone; and N,N-di-(2-ethylhexyl)-4-aminobenzoic acid ester of 4-(2-hydroxyethoxy)dibenzoylmethane and mixtures thereof.

[0153] Especially preferred sunscreen actives include 4,4'-t-butylmethoxydibenzoylmethane, 2-ethylhexyl-p-methoxycinnamate, phenyl benzimidazole sulfonic acid, and octocrylene.

[0154] A safe and effective amount of the organic sunscreen active is used, typically from about 1% to about 20%, more typically from about 2% to about 10% by weight of the composition. Exact amounts will vary depending upon the sunscreen or sunscreens chosen and the desired Sun Protection Factor (SPF).

[0155] Particulate Material

[0156] The compositions of the present invention may contain a particulate material, preferably a metallic oxide. These particulates can be coated or uncoated, charged or uncharged. Charged particulate materials are disclosed in U.S. Pat. No. 5,997,887, to Ha, et al., incorporated herein by reference. Particulate materials useful herein include; bismuth oxychloride, iron oxide, mica, mica treated with barium sulfate and TiO₂, silica, nylon, polyethylene, talc, styrene, polypropylene, ethylene/acrylic acid copolymer, sericite, aluminum oxide, silicone resin, ebarium sulfate, calcium carbonate, cellulose acetate, titanium dioxide, polymethyl methacrylate, and mixtures thereof.

[0157] Inorganic particulate materials, e.g., TiO₂, ZnO, or ZrO₂ are commercially available from a number of sources. One example of a suitable particulate material contains the material available from U.S. Cosmetics (TRONOX TiO₂ series, SAT-T CR837, a rutile TiO₂). Preferably, particulate materials are present in the composition in levels of from about 0.01% to about 2%, more preferably from about 0.05% to about 1.5%, still more preferably from about 0.1% to about 1%, by weight of the composition.

[0158] Conditioning Agents

[0159] The compositions of the present invention may contain a conditioning agent selected from humectants, moisturizers, or skin conditioners. A variety of these materials can be employed and each can be present at a level of from about 0.01% to about 20%, more preferably from about 0.1% to about 10%, and still more preferably from about 0.5% to about 7% by weight of the composition. These materials include, but are not limited to, guanidine; urea; glycolic acid and glycolate salts (e.g. ammonium and quaternary alkyl ammonium); salicylic acid; lactic acid and lactate salts (e.g., ammonium and quaternary alkyl ammonium); aloe vera in any of its variety of forms (e.g., aloe vera gel); polyhydroxy alcohols such as sorbitol, mannitol, xylitol, erythritol,

glycerol, hexanetriol, butanetriol, propylene glycol, butylene glycol, hexylene glycol and the like; polyethylene glycols; sugars (e.g., melibiose) and starches; sugar and starch derivatives (e.g., alkoxylated glucose, fructose, glucosamine); hyaluroinic acid; lactamide monoethanolamine; acetamide monoethanolamine; panthenol; allantoin; and mixtures thereof. Also useful herein are the propoxylated glycerols described in U.S. Pat. No. 4,976,953, to Orr et al., issued December 11, 1990.

[0160] Also useful are various C₁-C₃₀ monoesters and polyesters of sugars and related materials. These esters are derived from a sugar or polyol moiety and one or more carboxylic acid moieties. Such ester materials are further described in, U.S. Pat. No. 2,831,854, U.S. Pat. No. 4,005,196, to Jandacek, issued January 25, 1977; U.S. Pat. No. 4,005,195, to Jandacek, issued January 25, 1977, U.S. Pat. No. 5,306,516, to Letton et al., issued April 26, 1994; U.S. Pat. No. 5,306,515, to Letton et al., issued April 26, 1994; U.S. Pat. No. 5,305,514, to Letton et al., issued April 26, 1994; U.S. Pat. No. 4,797,300, to Jandacek et al., issued January 10, 1989; U.S. Pat. No. 3,963,699, to Rizzi et al., issued June 15, 1976; U.S. Pat. No. 4,518,772, to Volpenhein, issued May 21, 1985; and U.S. Pat. No. 4,517,360, to Volpenhein, issued May 21, 1985.

[0161] Preferably, the conditioning agent is selected from urea, guanidine, sucrose polyester, panthenol, dexpanthenol, allantoin, and combinations thereof.

[0162] Anti-glycation Actives

[0163] Glycation is a non-specific reaction between sugar molecules and proteins, leading to less elastic macromolecules and skin, brown spots and hue, and accelerated ageing. Combining ceramides, polypeptides of the present invention and anti-glycation products in cosmetic preparations will improve anti-wrinkle and anti-age treatment of skin. Antiglycation substances are, for instance, aminoguanidine, arginine derivatives, protein derivatives such as Integrissyme®

(offered by SEDERMA SAS France) or fermentation products such as Kombuchka®, also offered by SEDERMA.

[0164] Structuring Agents

[0165] The compositions hereof, and especially the emulsions hereof, may contain a structuring agent. Structuring agents are particularly preferred in the oil-in-water emulsions of the present invention. Without being limited by theory, it is believed that the structuring agent assists in providing rheological characteristics to the composition which contribute to the stability of the composition. For example, the structuring agent tends to assist in the formation of the liquid crystalline gel network structures. The structuring agent may also function as an emulsifier or surfactant. Preferred compositions of this invention contain from about 0.1% to about 20%, more preferably from about 0.1% to about 10%, still more preferably from about 0.5% to about 9%, of one or more structuring agents.

[0166] Preferred structuring agents are those having an HLB of from about 1 to about 8 and having a melting point of at least about 45°C. Suitable structuring agents are those selected from saturated C₁₄ to C₃₀ fatty alcohols, saturated C₁₆ to C₃₀ fatty alcohols containing from about 1 to about 5 moles of ethylene oxide, saturated C₁₆ to C₃₀ diols, saturated C₁₆ to C₃₀ monoglycerol ethers, saturated C₁₆ to C₃₀ hydroxy fatty acids, C₁₄ to C₃₀ hydroxylated and nonhydroxylated saturated fatty acids, C₁₄ to C₃₀ saturated ethoxylated fatty acids, amines and alcohols containing from about 1 to about 5 moles of ethylene oxide diols, C₁₄ to C₃₀ saturated glyceryl mono esters with a monoglyceride content of at least 40%, C₁₄ to C₃₀ saturated polyglycerol esters having from about 1 to about 3 alkyl group and from about 2 to about 3 saturated glycerol units, C₁₄ to C₃₀ glyceryl mono ethers, C₁₄ to C₃₀ sorbitan mono/diesters, C₁₄ to C₃₀ saturated ethoxylated sorbitan mono/diesters with about 1 to about 5 moles of ethylene oxide, C₁₄ to C₃₀ saturated methyl glucoside esters, C₁₄ to C₃₀ saturated sucrose mono/diesters, C₁₄ to C₃₀ saturated

ethoxylated methyl glucoside esters with about 1 to about 5 moles of ethylene oxide, C₁₄ to C₃₀ saturated polyglucosides having an average of between 1 to 2 glucose units and mixtures thereof, having a melting point of at least about 45°C.

[0167] The preferred structuring agents of the present invention are selected from stearic acid, palmitic acid, stearyl alcohol, cetyl alcohol, behenyl alcohol, stearic acid, palmitic acid, the polyethylene glycol ether of stearyl alcohol having an average of about 1 to about 5 ethylene oxide units, the polyethylene glycol ether of cetyl alcohol having an average of about 1 to about 5 ethylene oxide units, and mixtures thereof. More preferred structuring agents of the present invention are selected from stearyl alcohol, cetyl alcohol, behenyl alcohol, the polyethylene glycol ether of stearyl alcohol having an average of about 2 ethylene oxide units (steareth-2), the polyethylene glycol ether of cetyl alcohol having an average of about 2 ethylene oxide units, and mixtures thereof. Even more preferred structuring agents are selected from stearic acid, palmitic acid, stearyl alcohol, cetyl alcohol, behenyl alcohol, steareth-2, and mixtures thereof.

[0168] Thickening Agent (including thickeners and gelling agents)

[0169] The compositions of the present invention can contain one or more thickening agents, preferably from about 0.1% to about 5%, more preferably from about 0.1% to about 4%, and still more preferably from about 0.25% to about 3%, by weight of the composition.

[0170] Nonlimiting classes of thickening agents include those selected from the following:

[0171] Carboxylic Acid Polymers

[0172] These polymers are crosslinked compounds containing one or more monomers derived from acrylic acid, substituted acrylic acids, and salts and esters of these acrylic acids and the substituted acrylic acids, wherein the crosslinking agent contains two or more carbon-carbon double bonds and is derived

from a polyhydric alcohol. Polymers useful in the present invention are more fully described in U.S. Pat. No. 5,087,445, to Haffey et al., issued February 11, 1992; U.S. Pat. No. 4,509,949, to Huang et al., issued April 5, 1985; U.S. Pat. No. 2,798,053, to Brown, issued Jul. 2, 1957; and in CTFA International Cosmetic Ingredient Dictionary, Fourth Edition, 1991, pp. 12 and 80.

[0173] Examples of commercially available carboxylic acid polymers useful herein include the carbomers, which are homopolymers of acrylic acid crosslinked with allyl ethers of sucrose or pentaerythritol. The carbomers are available as the Carbopol® 900 series from B.F. Goodrich (e.g., Carbopol® 954). In addition, other suitable carboxylic acid polymeric agents include copolymers of C₁₀₋₃₀ alkyl acrylates with one or more monomers of acrylic acid, methacrylic acid, or one of their short chain (i.e., C₁₋₄ alcohol) esters, wherein the crosslinking agent is an allyl ether of sucrose or pentaerythritol. These copolymers are known as acrylates/C_{10-C30} alkyl acrylate cross polymers and are commercially available as Carbopol® 1342, Carbopol® 1382, Pemulen TR-1, and Pemulen TR-2, from B.F. Goodrich. In other words, examples of carboxylic acid polymer thickeners useful herein are those selected from carbomers, acrylates/C_{10-C30} alkyl acrylate cross polymers, and mixtures thereof. Especially useful are combinations with the ingredient range called LUBRAJELS offered by UNITED GUARDIAN, some of them described in WO 97/47310 of June 12, 1996.

[0174] b) Crosslinked Polyacrylate Polymers

[0175] The compositions of the present invention can optionally contain crosslinked polyacrylate polymers useful as thickeners or gelling agents including both cationic and nonionic polymers, with the cationics being generally preferred. Examples of useful crosslinked nonionic polyacrylate polymers and crosslinked cationic polyacrylate polymers are those described in U.S. Pat. No. 5,100,660, to Hawe et al., issued March 31, 1992; U.S. Pat. No. 4,849,484,

to Heard, issued Jul. 18, 1989; U.S. Pat. No. 4,835,206, to Farrar *et al.*, issued May 30, 1989; U.S. Pat. No. 4,628,078 to Glover *et al.* issued December 9, 1986; U.S. Pat. No. 4,599,379 to Flesher *et al.* issued Jul. 8, 1986; and EP 228,868, to Farrar *et al.*, published Jul. 15, 1987.

[0176] c) Polyacrylamide Polymers

[0177] The compositions of the present invention can optionally contain polyacrylamide polymers, especially nonionic polyacrylamide polymers including substituted branched or unbranched polymers. More preferred among these polyacrylamide polymers is the nonionic polymer given the CTFA designation polyacrylamide and isoparaffin and laureth-7, available under the trade name Sepigel 305 from Seppic Corporation (Fairfield, NJ).

[0178] Other polyacrylamide polymers useful herein include multi-block copolymers of acrylamides and substituted acrylamides with acrylic acids and substituted acrylic acids. Commercially available examples of these multi-block copolymers include Hypan SR150H, SS500V, SS500W, SSSA100H, from Lipo Chemicals, Inc. (Paterson, NJ).

[0179] d) Polysaccharides

[0180] A wide variety of polysaccharides are useful herein. "Polysaccharides" refer to gelling agents which contain a backbone of repeating sugar (*i.e.*, carbohydrate) units. Nonlimiting examples of polysaccharide gelling agents include those selected from cellulose, carboxymethyl hydroxyethylcellulose, cellulose acetate propionate carboxylate, hydroxyethylcellulose, hydroxyethyl ethylcellulose, hydroxypropylcellulose, hydroxypropyl methylcellulose, methyl hydroxyethylcellulose, microcrystalline cellulose, sodium cellulose sulfate, and mixtures thereof. Also useful herein are the alkyl substituted celluloses. In these polymers, the hydroxy groups of the cellulose polymer is hydroxyalkylated (preferably hydroxyethylated or hydroxypropylated) to form a hydroxyalkylated cellulose which is then further modified with

a C₁₀-C₃₀ straight chain or branched chain alkyl group through an ether linkage. Typically these polymers are ethers of C₁₀-C₃₀ straight or branched chain alcohols with hydroxyalkyl-celluloses. Examples of alkyl groups useful herein include those selected from stearyl, isostearyl, lauryl, myristyl, cetyl, isocetyl, cocoyl (i.e. alkyl groups derived from the alcohols of coconut oil), palmityl, oleyl, linoleyl, linolenyl, ricinoleyl, behenyl, and mixtures thereof. Preferred among the alkyl hydroxyalkyl cellulose ethers is the material given the CTFA designation cetyl hydroxyethylcellulose, which is the ether of cetyl alcohol and hydroxyethylcellulose. This material is sold under the trade name Natrosol® CS Plus from Aqualon Corporation (Wilmington, DE).

[0181] Other useful polysaccharides include scleroglucans which are a linear chain of (1-3) linked glucose units with a (1-6) linked glucose every three units, a commercially available example of which is Clearogel™ CS11 from Michel Mercier Products Inc. (Mountainside, NJ).

[0182] e) Gums

[0183] Other thickening and gelling agents useful herein include materials which are primarily derived from natural sources. Nonlimiting examples of these gelling agent gums include acacia, agar, algin, alginic acid, ammonium alginate, amylopectin, calcium alginate, calcium carrageenan, carnitine, carrageenan, dextrin, gelatin, gellan gum, guar gum, guar hydroxypropyltrimonium chloride, hectorite, hyaluroinic acid, hydrated silica, hydroxypropyl chitosan, hydroxypropyl guar, karaya gum, kelp, locust bean gum, natto gum, potassium alginate, potassium carrageenan, propylene glycol alginate, sclerotium gum, sodium carboxymethyl dextran, sodium carrageenan, tragacanth gum, xanthan gum, and mixtures thereof.

[0184] Preferred compositions of the present invention include a thickening agent selected from carboxylic acid polymers, crosslinked polyacrylate polymers, polyacrylamide

polymers, and mixtures thereof, more preferably selected from carboxylic acid polymers, polyacrylamide polymers, and mixtures thereof.

[0185] Dermatologically-Acceptable Carrier

[0186] The compositions of the invention may be used in various cosmetic and/or personal care products, for example, skin care, hair care, nail care, facial and body care and sunscreen compositions, such as lotions, gels, sprays, and the like, hand cleaners, bath compositions, suntan oils, anti-perspirant compositions, perfumes and colognes, cold creams, hair sunscreen compositions, pre-shaves, deodorants, topical pharmaceutical ointments, skin moisturizers, facial cleansers, cleansing creams, skin gels, shampoos, hair conditioners, detergents, household cleaning products, make-up products, lipstick products, mascara, and hair coloring products. Therefore, in addition to any of the above cited skin care or hair care peptides and other actives, the cosmetic compositions described in the present invention may often include as an additional ingredient a dermatologically acceptable carrier. The form of the carrier and the final product resulting from the combination of the hexapeptides with any additional active and with the carrier may be any of the following: liquids, gels, creams, water-in-oil and oil-in-water, and silicone emulsions, foams, and solids; they may be clear or opaque; and may be formulated as both aqueous and non-aqueous preparations, including but not limited to topical preparations.

[0187] To realize the invention in any of these physical forms, further substances, agents and compounds are useful although not always necessary such as Conditioning Agents, Structuring Agents and Thickening Agents. These compounds sometimes also have the role of adjuvant and sometimes the role of additional ingredient. Neither role excludes them from the present invention as being combined with the hexapeptide/ceramide mixtures of the invention and their derivatives.

[0188] The nature of the dermatologically acceptable carrier, the nature of the final product, and the methods of preparing those need not be described here in detail; many examples can be found in the available literatures, such as PCT application No. WO 00/62743 filed by Larry R. Robinson et al. on April 19, 2000, published on October 26, 2000, or, more generally, in *Milady's Standard Textbook of Cosmetology 2000*, (Delmar Learning) or in *Formulation Technology: Emulsions, Suspensions, Solid Forms* by Hans Mollet, Arnold Grubenmann and Helen Payne, published by John Wiley & Sons (January 23, 2001), or in *Chemistry and Technology of the Cosmetics and Toiletries Industry* by Clifford Williams Schmitt, Kluwer Academic Publishers, Dordrecht July 1996, all hereby incorporated. Fiedler's *Encyclopedia of Excipients*, fifth edition, Edition Cantor Verlag Aulendorf, 2002 is also a useful guide for the formulator skilled in the art of developing cosmetic carriers. All ingredients listed therein may in one way or another be combined to form a dermatologically acceptable carrier and/or used as an additional ingredient for the cosmetic compositions of the invention.

[0189] A safe and effective amount of carrier is from about 50% to about 99.99%, preferably from about 80% to about 99.9%, more preferably from about 90% to about 98%, and even more preferably from about 90% to about 95% of the composition.

[0190] The carrier can be in a wide variety of forms. For example, emulsion carriers, including, but not limited to, oil-in-water, water-in-oil, water-in-oil-in-water, and oil-in-water-in-silicone emulsions, are useful herein.

[0191] Preferred carriers contain an emulsion such as oil-in-water emulsions, water-in-oil emulsions, and water-in-silicone emulsions. As will be understood by the skilled artisan, a given component will distribute primarily into either the water or oil/silicone phase, depending on the water solubility/dispersibility of the component in the composition. Oil-in-water emulsions are especially preferred.

[0192] Emulsions according to the present invention generally contain a solution as described above and a lipid or oil. Lipids and oils may be derived from animals, plants, or petroleum and may be natural or synthetic (i.e., man-made). Preferred emulsions also contain a humectant, such as glycerin. Emulsions will preferably further contain from about 0.01% to about 10%, more preferably from about 0.1% to about 5%, of an emulsifier, based on the weight of the carrier. Emulsifiers may be nonionic, anionic or cationic. Suitable emulsifiers are disclosed in, for example, U.S. Pat. No. 3,755,560, issued August 28, 1973, Dickert *et al.*; U.S. Pat. No. 4,421,769, issued December 20, 1983, Dixon *et al.*; and McCutcheon's Detergents and Emulsifiers, North American Edition, pages 317-324 (1986).

[0193] The emulsion may also contain an anti-foaming agent to minimize foaming upon application to the keratinous tissue. Anti-foaming agents include high molecular weight silicones and other materials well known in the art for such use.

[0194] Suitable emulsions may have a wide range of viscosities, depending on the desired product form. Exemplary low viscosity emulsions, which are preferred, have a viscosity of about 50 centistokes or less, more preferably about 10 centistokes or less, still more preferably about 5 centistokes or less.

[0195] Preferred water-in-silicone and oil-in-water emulsions are described in greater detail below.

[0196] Water-in-silicone Emulsion

[0197] Water-in-silicone emulsions contain a continuous silicone phase and a dispersed aqueous phase.

[0198] Continuous Silicone Phase

[0199] Preferred water-in-silicone emulsions of the present invention contain from about 1% to about 60%, preferably from about 5% to about 40%, more preferably from about 10% to about 20%, by weight of a continuous silicone phase. The continuous silicone phase exists as an external phase that contains or

surrounds the discontinuous aqueous phase described hereinafter.

[0200] The continuous silicone phase contains a polyorganosiloxane oil. A preferred water-in-silicone emulsion system is formulated to provide an oxidatively stable vehicle for the retinoid. The continuous silicone phase of these preferred emulsions contain between about 50% and about 99.9% by weight of organopolysiloxane oil and less than about 50% by weight of a non-silicone oil. In an especially preferred embodiment, the continuous silicone phase contains at least about 50%, preferably from about 60% to about 99.9%, more preferably from about 70% to about 99.9%, and even more preferably from about 80% to about 99.9%, polyorganosiloxane oil by weight of the continuous silicone phase, and up to about 50% non-silicone oils, preferably less about 40%, more preferably less than about 30%, even more preferably less than about 10%, and even more preferably less than about 2%, by weight of the continuous silicone phase. These preferred emulsion systems provide more oxidative stability to the retinoid over extended periods of time than comparable water-in-oil emulsions containing lower concentrations of the polyorganosiloxane oil. Concentrations of non-silicone oils in the continuous silicone phase are minimized or avoided altogether so as to further enhance oxidative stability of the selected retinoid in the compositions. Water-in-silicone emulsions of this type are described in PCT Application WO 97/21423, published June 19, 1997.

[0201] The organopolysiloxane oil for use in the composition may be volatile, non-volatile, or a mixture of volatile and non-volatile silicones. The term "nonvolatile" as used in this context refers to those silicones that are liquid under ambient conditions and have a flash point (under one atmospheric of pressure) of or greater than about 100°C. The term "volatile" as used in this context refers to all other silicone oils. Suitable organopolysiloxanes can be selected from a wide variety of silicones spanning a broad range of

volatilities and viscosities. Examples of suitable organopolysiloxane oils include polyalkylsiloxanes, cyclic polyalkylsiloxanes, and polyalkylarylsiloxanes.

[0202] Polyalkylsiloxanes useful in the composition herein include polyalkylsiloxanes with viscosities of from about 0.5 to about 1,000,000 centistokes at 25°C. Such polyalkylsiloxanes can be represented by the general chemical formula $R_3SiO[R_2SiO]_xSiR_3$ wherein R is an alkyl group having from one to about 30 carbon atoms (preferably R is methyl or ethyl, more preferably methyl; also mixed alkyl groups can be used in the same molecule), and x is an integer from 0 to about 10,000, chosen to achieve the desired molecular weight which can range to over about 10,000,000. Commercially available polyalkylsiloxanes include the polydimethylsiloxanes, which are also known as dimethicones, examples of which include the Vicasil® series sold by General Electric Company and the Dow Corning® 200 series sold by Dow Corning Corporation. Specific examples of suitable polydimethylsiloxanes include Dow Corning® 200 fluid having a viscosity of 0.65 centistokes and a boiling point of 100°C., Dow Corning® 225 fluid having a viscosity of 10 centistokes and a boiling point greater than 200°C., and Dow Corning® 200 fluids having viscosities of 50, 350, and 12,500 centistokes, respectively, and boiling points greater than 200°C. Suitable dimethicones include those represented by the chemical formula $(CH_3)_3SiO[(CH_3)_2SiO]_x[CH_3RSiO]_ySi(CH_3)_3$ wherein R is straight or branched chain alkyl having from two to about 30 carbon atoms and x and y are each integers of 1 or greater selected to achieve the desired molecular weight which can range to over about 10,000,000. Examples of these alkyl-substituted dimethicones include cetyl dimethicone and lauryl dimethicone.

[0203] Cyclic polyalkylsiloxanes suitable for use in the composition include those represented by the chemical formula $[SiR_2—O]_n$ wherein R is an alkyl group (preferably R is methyl or ethyl, more preferably methyl) and n is an integer from about 3 to about 8, more preferably n is an integer from about

3 to about 7, and still more preferably n is an integer from about 4 to about 6. When R is methyl, these materials are typically referred to as cyclomethicones. Commercially available cyclomethicones include Dow Corning® 244 fluid having a viscosity of 2.5 centistokes, and a boiling point of 172°C., which primarily contains the cyclomethicone tetramer (i.e. n=4), Dow Corning® 344 fluid having a viscosity of 2.5 centistokes and a boiling point of 178°C., which primarily contains the cyclomethicone pentamer (i.e. n=5), Dow Corning® 245 fluid having a viscosity of 4.2 centistokes and a boiling point of 205°C., which primarily contains a mixture of the cyclomethicone tetramer and pentamer (i.e. n=4 and 5), and Dow Corning® 345 fluid having a viscosity of 4.5 centistokes and a boiling point of 217°, which primarily contains a mixture of the cyclomethicone tetramer, pentamer, and hexamer (i.e. n=4, 5, and 6).

[0204] Also useful are materials such as trimethylsiloxysilicate, which is a polymeric material corresponding to the general chemical formula $[(CH_3)_3SiO_{1/2}]_x[SiO_2]_y$, wherein x is an integer from about 1 to about 500 and y is an integer from about 1 to about 500. A commercially available trimethylsiloxysilicate is sold as a mixture with dimethicone as Dow Corning® 593 fluid.

[0205] Dimethiconols are also suitable for use in the composition. These compounds can be represented by the chemical formulas $R_3SiO[R_2SiO]_xSiR_2OH$ and $HOR_2SiO[R_2SiO]_xSiR_2OH$ wherein R is an alkyl group (preferably R is methyl or ethyl, more preferably methyl) and x is an integer from 0 to about 500, chosen to achieve the desired molecular weight. Commercially available dimethiconols are typically sold as mixtures with dimethicone or cyclomethicone (e.g. Dow Corning® 1401, 1402, and 1403 fluids).

[0206] Polyalkylaryl siloxanes are also suitable for use in the composition. Polymethylphenyl siloxanes having viscosities from about 15 to about 65 centistokes at 25°C. are especially useful.

[0207] Preferred for use herein are organopolysiloxanes selected from polyalkylsiloxanes, alkyl substituted dimethicones, cyclomethicones, trimethylsiloxysilicates, dimethiconols, polyalkylaryl siloxanes, and mixtures thereof. More preferred for use herein are polyalkylsiloxanes and cyclomethicones. Preferred among the polyalkylsiloxanes are dimethicones.

[0208] As stated above, the continuous silicone phase may contain one or more non-silicone oils. Concentrations of non-silicone oils in the continuous silicone phase are preferably minimized or avoided altogether so as to further enhance oxidative stability of the selected retinoid in the compositions. Suitable non-silicone oils have a melting point of about 25°C. or less under about one atmosphere of pressure. Examples of non-silicone oils suitable for use in the continuous silicone phase are those well known in the chemical arts in topical personal care products in the form of water-in-oil emulsions, e.g., mineral oil, vegetable oils, synthetic oils, semisynthetic oils, etc.

[0209] (2) Dispersed Aqueous Phase

[0210] The topical compositions of the present invention contain from about 30% to about 90%, more preferably from about 50% to about 85%, and still more preferably from about 70% to about 80% of a dispersed aqueous phase. In emulsion technology, the term "dispersed phase" is a term well-known to one skilled in the art which means that the phase exists as small particles or droplets that are suspended in and surrounded by a continuous phase. The dispersed phase is also known as the internal or discontinuous phase. The dispersed aqueous phase is a dispersion of small aqueous particles or droplets suspended in and surrounded by the continuous silicone phase described hereinbefore.

[0211] The aqueous phase can be water, or a combination of water and one or more water soluble or dispersible ingredients. Nonlimiting examples of such ingredients include thickeners, acids, bases, salts, chelants, gums, water-soluble

or dispersible alcohols and polyols, buffers, preservatives, sunscreens agents, colorings, and the like.

[0212] The topical compositions of the present invention will typically contain from about 25% to about 90%, preferably from about 40% to about 80%, more preferably from about 60% to about 80%, water in the dispersed aqueous phase by weight of the composition.

[0213] (3) Emulsifier for Dispersing the Aqueous Phase

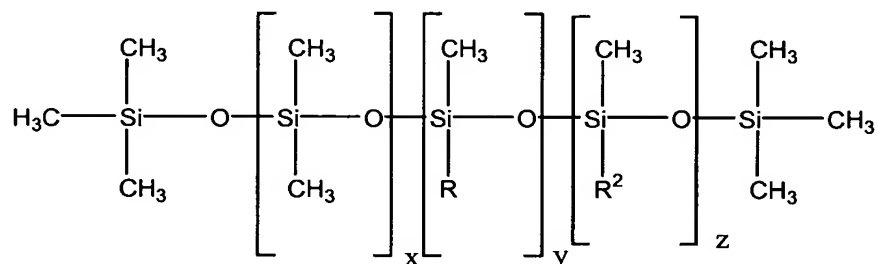
[0214] The water-in-silicone emulsions of the present invention preferably contain an emulsifier. In a preferred embodiment, the composition contains from about 0.1% to about 10% emulsifier, more preferably from about 0.5% to about 7.5%, still more preferably from about 1% to about 5%, emulsifier by weight of the composition. The emulsifier helps disperse and suspend the aqueous phase within the continuous silicone phase.

[0215] A wide variety of emulsifying agents can be employed herein to form the preferred water-in-silicone emulsion. Known or conventional emulsifying agents can be used in the composition, provided that the selected emulsifying agent is chemically and physically compatible with components of the composition of the present invention, and provides the desired dispersion characteristics. Suitable emulsifiers include silicone emulsifiers, non-silicon-containing emulsifiers, and mixtures thereof, known by those skilled in the art for use in topical personal care products. Preferably these emulsifiers have an HLB value of or less than about 14, more preferably from about 2 to about 14, and still more preferably from about 4 to about 14. Emulsifiers having an HLB value outside of these ranges can be used in combination with other emulsifiers to achieve an effective weighted average HLB for the combination that falls within these ranges.

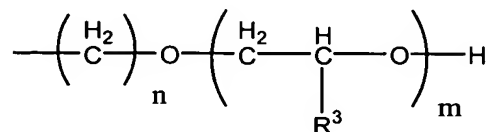
[0216] Silicone emulsifiers are preferred. A wide variety of silicone emulsifiers are useful herein. These silicone emulsifiers are typically organically modified organopolysiloxanes, also known to those skilled in the art as

silicone surfactants. Useful silicone emulsifiers include dimethicone copolyols. These materials are polydimethyl siloxanes which have been modified to include polyether side chains such as polyethylene oxide chains, polypropylene oxide chains, mixtures of these chains, and polyether chains containing moieties derived from both ethylene oxide and propylene oxide. Other examples include alkyl-modified dimethicone copolyols, i.e., compounds which contain C2-C30 pendant side chains. Still other useful dimethicone copolyols include materials having various cationic, anionic, amphoteric, and zwitterionic pendant moieties.

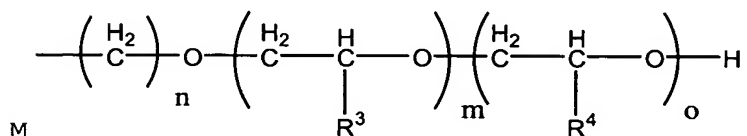
[0217] The dimethicone copolyol emulsifiers useful herein can be described by the following general structure:



wherein R is C1-C30 straight, branched, or cyclic alkyl and R² is selected from the group consisting of



and



wherein n is an integer from 3 to about 10; R³ and R⁴ are selected from the group consisting of H and C1-C6 straight or branched chain alkyl such that R³ and R⁴ are not simultaneously the same; and m, o, x, and y are selected such that the molecule has an overall molecular weight from about 200 to about 10,000,000, with m, o, x, and y being independently

selected from integers of zero or greater such that m and o are not both simultaneously zero, and z being independently selected from integers of 1 or greater. It is recognized that positional isomers of these copolyols can be achieved. The chemical representations depicted above for the R² moieties containing the R³ and R⁴ groups are not meant to be limiting but are shown as such for convenience.

[0218] Also useful herein, although not strictly classified as dimethicone copolyols, are silicone surfactants as depicted in the structures in the previous paragraph wherein R² is: $\text{---}(\text{CH}_2)_n\text{---O---R}^5$, wherein R⁵ is a cationic, anionic, amphoteric, or zwitterionic moiety.

[0219] Nonlimiting examples of dimethicone copolyols and other silicone surfactants useful as emulsifiers herein include polydimethylsiloxane polyether copolymers with pendant polyethylene oxide sidechains, polydimethylsiloxane polyether copolymers with pendant polypropylene oxide sidechains, polydimethylsiloxane polyether copolymers with pendant mixed polyethylene oxide and polypropylene oxide sidechains, polydimethylsiloxane polyether copolymers with pendant mixed poly(ethylene)(propylene)oxide sidechains, polydimethylsiloxane polyether copolymers with pendant organobetaine sidechains, polydimethylsiloxane polyether copolymers with pendant carboxylate sidechains, polydimethylsiloxane polyether copolymers with pendant quaternary ammonium sidechains; and also further modifications of the preceding copolymers containing pendant C2-C30 straight, branched, or cyclic alkyl moieties. Examples of commercially available dimethicone copolyols useful herein sold by Dow Corning Corporation are Dow Corning® 190, 193, Q2-5220, 2501 Wax, 2-5324 fluid, and 3225C (this later material being sold as a mixture with cyclomethicone). Cetyl dimethicone copolyol is commercially available as a mixture with polyglyceryl-4 isostearate (and) hexyl laurate and is sold under the trade name ABIL® WE-09 (available from Goldschmidt). Cetyl dimethicone copolyol is also commercially

available as a mixture with hexyl laurate (and) polyglyceryl-3 oleate (and) cetyl dimethicone and is sold under the trade name ABIL® WS-08 (also available from Goldschmidt). Other nonlimiting examples of dimethicone copolyols also include lauryl dimethicone copolyol, dimethicone copolyol acetate, dimethicone copolyol adipate, dimethicone copolyolamine, dimethicone copolyol behenate, dimethicone copolyol butyl ether, dimethicone copolyol hydroxy stearate, dimethicone copolyol isostearate, dimethicone copolyol laurate, dimethicone copolyol methyl ether, dimethicone copolyol phosphate, and dimethicone copolyol stearate. See International Cosmetic Ingredient Dictionary, Fifth Edition, 1993.

[0220] Dimethicone copolyol emulsifiers useful herein are described, for example, in U.S. Pat. No. 4,960,764, to Figueroa, Jr. *et al.*, issued October 2, 1990; European Patent No. EP 330,369, to SanoGueira, published August 30, 1989; G. H. Dahms, *et al.*, "New Formulation Possibilities Offered by Silicone Copolyols," *Cosmetics & Toiletries*, vol. 110, pp. 91-100, March 1995; M. E. Carlotti *et al.*, "Optimization of W/O-S Emulsions And Study Of The Quantitative Relationships Between Ester Structure And Emulsion Properties," *J. Dispersion Science And Technology*, 13(3), 315-336 (1992); P. Hameyer, "Comparative Technological Investigations of Organic and Organosilicone Emulsifiers in Cosmetic Water-in-Oil Emulsion Preparations," *HAPPI* 28(4), pp. 88-128 (1991); J. Smid-Korbar *et al.*, "Efficiency and usability of silicone surfactants in emulsions," *Provisional Communication International Journal of Cosmetic Science*, 12, 135-139 (1990); and D. G. Krzysik *et al.*, "A New Silicone Emulsifier For Water-in-Oil Systems," *Drug and Cosmetic Industry*, vol. 146(4) pp. 28-81 (April 1990).

[0221] Among the non-silicone-containing emulsifiers useful herein are various non-ionic and anionic emulsifying agents such as sugar esters and polyesters, alkoxylated sugar esters and polyesters, C1-C30 fatty acid esters of C1-C30 fatty

alcohols, alkoxyated derivatives of C1-C30 fatty acid esters of C1-C30 fatty alcohols, alkoxyated ethers of C1-C30 fatty alcohols, polyglyceryl esters of C1-C30 fatty acids, C1-C30 esters of polyols, C1-C30 ethers of polyols, alkyl phosphates, polyoxyalkylene fatty ether phosphates, fatty acid amides, acyl lactylates, soaps, and mixtures thereof. Other suitable emulsifiers are described, for example, in McCutcheon's, Detergents and Emulsifiers, North American Edition (1986), published by Allured Publishing Corporation; U.S. Pat. No. 5,011,681 to Ciotti et al., issued April 30, 1991; U.S. Pat. No. 4,421,769 to Dixon et al., issued December 20, 1983; and U.S. Pat. No. 3,755,560 to Dickert et al., issued August 28, 1973.

[0222] Nonlimiting examples of these non-silicon-containing emulsifiers include: polyethylene glycol 20 sorbitan monolaurate (Polysorbate 20), polyethylene glycol 5 soya sterol, Steareth-20, Ceteareth-20, PPG-2 methyl glucose ether distearate, Ceteth-10, Polysorbate 80, cetyl phosphate, potassium cetyl phosphate, diethanolamine cetyl phosphate, Polysorbate 60, glyceryl stearate, PEG-100 stearate, polyoxyethylene 20 sorbitan trioleate (Polysorbate 85), sorbitan monolaurate, polyoxyethylene 4 lauryl ether sodium stearate, polyglyceryl-4 isostearate, hexyl laurate, steareth-20, ceteareth-20, PPG-2 methyl glucose ether distearate, ceteth-10, diethanolamine cetyl phosphate, glyceryl stearate, PEG- 100 stearate, and mixtures thereof.

[0223] B) Oil-in-Water Emulsions

[0224] Other preferred topical carriers include oil-in-water emulsions, having a continuous aqueous phase and a hydrophobic, water-insoluble phase ("oil phase") dispersed therein. Examples of suitable oil-in-water emulsion carriers are described in U.S. Pat. No. 5,073,371, to Turner, D. J. et al., issued December 17, 1991, and U.S. Pat. No. 5,073,372, to Turner, D. J. et al., issued December 17, 1991. An especially preferred oil-in-water emulsion, containing a structuring

agent, hydrophilic surfactant and water, is described in detail hereinafter.

[0225] Structuring Agent

[0226] A preferred oil-in-water emulsion contains a structuring agent to assist in the formation of a liquid crystalline gel network structure. Without being limited by theory, it is believed that the structuring agent assists in providing rheological characteristics to the composition which contribute to the stability of the composition. The structuring agent may also function as an emulsifier or surfactant. Preferred compositions of this invention contain from about 0.5% to about 20%, more preferably from about 1% to about 10%, even more preferably from about 1% to about 5%, by weight of the composition, of a structuring agent.

[0227] The preferred structuring agents of the present invention include stearic acid, palmitic acid, stearyl alcohol, cetyl alcohol, behenyl alcohol, stearic acid, palmitic acid, the polyethylene glycol ether of stearyl alcohol having an average of about 1 to about 21 ethylene oxide units, the polyethylene glycol ether of cetyl alcohol having an average of about 1 to about 5 ethylene oxide units, and mixtures thereof. More preferred structuring agents of the present invention are selected from stearyl alcohol, cetyl alcohol, behenyl alcohol, the polyethylene glycol ether of stearyl alcohol having an average of about 2 ethylene oxide units (steareth-2), the polyethylene glycol ether of stearyl alcohol having an average of about 21 ethylene oxide units (steareth-21), the polyethylene glycol ether of cetyl alcohol having an average of about 2 ethylene oxide units, and mixtures thereof. Even more preferred structuring agents are selected from stearic acid, palmitic acid, stearyl alcohol, cetyl alcohol, behenyl alcohol, steareth-2, steareth-21, and mixtures thereof.

[0228] (2) Hydrophilic Surfactant

[0229] The preferred oil-in-water emulsions contain from about 0.05% to about 10%, preferably from about 1% to about

6%, and more preferably from about 1% to about 3% of at least one hydrophilic surfactant which can disperse the hydrophobic materials in the water phase (percentages by weight of the topical carrier). The surfactant, at a minimum, must be hydrophilic enough to disperse in water.

[0230] Preferred hydrophilic surfactants are selected from nonionic surfactants. Among the nonionic surfactants that are useful herein are those that can be broadly defined as condensation products of long chain alcohols, e.g. C8-30 alcohols, with sugar or starch polymers, i.e., glycosides. These compounds can be represented by the formula $(S)_n-O-R$ wherein S is a sugar moiety such as glucose, fructose, mannose, and galactose; n is an integer of from about 1 to about 1000, and R is a C8-30 alkyl group. Examples of long chain alcohols from which the alkyl group can be derived include decyl alcohol, cetyl alcohol, stearyl alcohol, lauryl alcohol, myristyl alcohol, oleyl alcohol, and the like. Preferred examples of these surfactants include those wherein S is a glucose moiety, R is a C8-20 alkyl group, and n is an integer of from about 1 to about 9. Commercially available examples of these surfactants include decyl polyglucoside (available as APG 325 CS from Henkel) and lauryl polyglucoside (available as APG 600 CS and 625 CS from Henkel).

[0231] Other useful nonionic surfactants include the condensation products of alkylene oxides with fatty acids (i.e. alkylene oxide esters of fatty acids). These materials have the general formula $RCO(X)_nOH$ wherein R is a C10-30 alkyl group, X is $-OCH_2CH_2-$ (i.e. derived from ethylene glycol or oxide) or $-OCH_2CH_2CH_2-$ (i.e. derived from propylene glycol or oxide), and n is an integer from about 6 to about 200. Other nonionic surfactants are the condensation products of alkylene oxides with 2 moles of fatty acids (i.e. alkylene oxide diesters of fatty acids). These materials have the general formula $RCO(X)_nOOCR$ wherein R is a C10-30 alkyl group, X is $-OCH_2CH_2-$ (i.e. derived from ethylene glycol or oxide) or

—OCH₂CH₃— (i.e. derived from propylene glycol or oxide), and n is an integer from about 6 to about 100. Other nonionic surfactants are the condensation products of alkylene oxides with fatty alcohols (i.e. alkylene oxide ethers of fatty alcohols). These materials have the general formula R(X)_n OR' wherein R is a C10-30 alkyl group, X is —OCH₂CH₂— (i.e., derived from ethylene glycol or oxide) or —OCH₂CH₃— (i.e., derived from propylene glycol or oxide), and n is an integer from about 6 to about 100 and R' is H or a C10-30 alkyl group. Still other nonionic surfactants are the condensation products of alkylene oxides with both fatty acids and fatty alcohols [i.e. wherein the polyalkylene oxide portion is esterified on one end with a fatty acid and etherified (i.e. connected via an ether linkage) on the other end with a fatty alcohol]. These materials have the general formula RCO(X)_n OR' wherein R and R' are C10-30 alkyl groups, X is —OCH₂CH₂— (i.e., derived from ethylene glycol or oxide) or —OCH₂CH₃— (derived from propylene glycol or oxide), and n is an integer from about 6 to about 100. Nonlimiting examples of these alkylene oxide derived nonionic surfactants include ceteth-6, ceteth-10, ceteth-12, ceteareth-6, ceteareth-10, ceteareth-12, steareth-6, steareth-10, steareth-12, steareth-21, PEG-6 stearate, PEG-10 stearate, PEG-100 stearate, PEG-12 stearate, PEG-20 glyceryl stearate, PEG-80 glyceryl tallowate, PEG-10 glyceryl stearate, PEG-30 glyceryl cocoate, PEG-80 glyceryl cocoate, PEG-200 glyceryl tallowate, PEG-8 dilaurate, PEG-10 distearate, and mixtures thereof.

[0232] Still other useful nonionic surfactants include polyhydroxy fatty acid amide surfactants corresponding to the structural formula:

$$\text{R}^2\text{—}\overset{\text{O}}{\underset{\parallel}{\text{C}}}\text{—}\overset{\text{R}^1}{\underset{|}{\text{N}}}\text{—Z},$$

wherein: R¹ is H, C₁-C₄ alkyl, 2-hydroxyethyl, 2-hydroxy-propyl, preferably C₁-C₄ alkyl, more preferably methyl or ethyl, most preferably methyl; R² is C₅-C₃₁ alkyl or alkenyl, preferably C₇-C₁₉ alkyl or alkenyl, more preferably C₉-

C₁₇ alkyl or alkenyl, most preferably C₁₁-C₁₅ alkyl or alkenyl; and Z is a polhydroxyhydrocarbyl moiety having a linear hydrocarbyl chain with a least 3 hydroxyls directly connected to the chain, or an alkoxyated derivative (preferably ethoxyated or propoxyated) thereof. Z preferably is a sugar moiety selected from the group consisting of glucose, fructose, maltose, lactose, galactose, mannose, xylose, and mixtures thereof. An especially preferred surfactant corresponding to the above structure is coconut alkyl N-methyl glucoside amide (i.e., wherein the R²CO— moiety is derived from coconut oil fatty acids). Processes for making compositions containing polyhydroxy fatty acid amides are disclosed, for example, in G.B. Patent Specification 809,060, published February 18, 1959, by Thomas Hedley & Co., Ltd.; U.S. Pat. No. 2,965,576, to E. R. Wilson, issued December 20, 1960; U.S. Pat. No. 2,703,798, to A. M. Schwartz, issued March 8, 1955; and U.S. Pat. No. 1,985,424, to Piggott, issued December 25, 1934; which are incorporated herein by reference in their entirety.

[0233] Preferred among the nonionic surfactants are those selected from the group consisting of steareth-21, cetareth-20, cetareth-12, sucrose cocoate, steareth-100, PEG-100 stearate, and mixtures thereof.

[0234] Other nonionic surfactants suitable for use herein include sugar esters and polyesters, alkoxyated sugar esters and polyesters, C₁-C₃₀ fatty acid esters of C₁-C₃₀ fatty alcohols, alkoxyated derivatives of C₁-C₃₀ fatty acid esters of C₁-C₃₀ fatty alcohols, alkoxyated ethers of C₁-C₃₀ fatty alcohols, polyglyceryl esters of C₁-C₃₀ fatty acids, C₁-C₃₀ esters of polyols, C₁-C₃₀ ethers of polyols, alkyl phosphates, polyoxyalkylene fatty ether phosphates, fatty acid amides, acyl lactylates, and mixtures thereof. Nonlimiting examples of these emulsifiers include: polyethylene glycol 20 sorbitan monolaurate (Polysorbate 20), polyethylene glycol 5 soya sterol, Steareth-20, Cetareth-20, PPG-2 methyl glucose ether distearate, Ceteth-10, Polysorbate 80, cetyl phosphate,

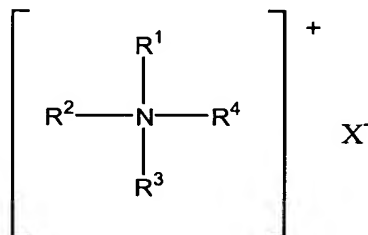
potassium cetyl phosphate, diethanolamine cetyl phosphate, Polysorbate 60, glyceryl stearate, polyoxyethylene 20 sorbitan trioleate (Polysorbate 85), sorbitan monolaurate, polyoxyethylene 4 lauryl ether sodium stearate, polyglyceryl-4 isostearate, hexyl laurate, PPG-2 methyl glucose ether distearate, PEG-100 stearate, and mixtures thereof.

[0235] Another group of non-ionic surfactants useful herein are fatty acid ester blends based on a mixture of sorbitan or sorbitol fatty acid ester and sucrose fatty acid ester, the fatty acid in each instance being preferably C_8 - C_{24} , more preferably C_{10} - C_{20} . The preferred fatty acid ester emulsifier is a blend of sorbitan or sorbitol C_{16} - C_{20} fatty acid ester with sucrose C_{10} - C_{16} fatty acid ester, especially sorbitan stearate and sucrose cocoate. This is commercially available from ICI under the trade name Arlatone 2121.

[0236] Other suitable surfactants useful herein include a wide variety of cationic, anionic, zwitterionic, and amphoteric surfactants such as are known in the art and discussed more fully below. See, e.g., McCutcheon's, Detergents and Emulsifiers, North American Edition (1986), published by Allured Publishing Corporation; U.S. Pat. No. 5,011,681 to Ciotti et al., issued April 30, 1991; U.S. Pat. No. 4,421,769 to Dixon et al., issued December 20, 1983; and U.S. Pat. No. 3,755,560 to Dickert et al., issued August 28, 1973; these four references are incorporated herein by reference in their entirety. The hydrophilic surfactants useful herein can contain a single surfactant, or any combination of suitable surfactants. The exact surfactant (or surfactants) chosen will depend upon the pH of the composition and the other components present.

[0237] Also useful herein are cationic surfactants, especially dialkyl quaternary ammonium compounds or "quats", examples of which are described in U.S. Pat. No. 5,151,209; U.S. Pat. No. 5,151,210; U.S. Pat. No. 5,120,532; U.S. Pat. No. 4,387,090; U.S. Pat. No. 3,155,591; U.S. Pat. No. 3,929,678; U.S. Pat. No. 3,959,461; McCutcheon's Detergents &

Emulsifiers, (North American edition 1979) M.C. Publishing Co.; and Schwartz, et al., Surface Active Agents, Their Chemistry and Technology, New York: Interscience Publishers, 1949; which descriptions are incorporated herein by reference. The cationic surfactants useful herein include cationic ammonium salts such as those having the formula:



wherein R_1 , is an alkyl group having from about 12 to about 30 carbon atoms, or an aromatic, aryl or alkaryl group having from about 12 to about 30 carbon atoms; R_2 , R_3 , and R_4 are independently selected from hydrogen, an alkyl group having from about 1 to about 22 carbon atoms, or aromatic, aryl or alkaryl groups having from about 12 to about 22 carbon atoms; and X is any compatible anion, preferably selected from chloride, bromide, iodide, acetate, phosphate, nitrate, sulfate, methyl sulfate, ethyl sulfate, tosylate, lactate, citrate, glycolate, and mixtures thereof. Additionally, the alkyl groups of R_1 , R_2 , R_3 , and R_4 can also contain ester and/or ether linkages, or hydroxy or amino group substituents (e.g., the alkyl groups can contain polyethylene glycol and polypropylene glycol moieties).

[0238] More preferably, R_1 is an alkyl group having from about 12 to about 22 carbon atoms; R_2 is selected from H or an alkyl group having from about 1 to about 22 carbon atoms; R_3 and R_4 are independently selected from H or an alkyl group having from about 1 to about 3 carbon atoms; and X is as described previously.

[0239] Still more preferably, R_1 is an alkyl group having from about 12 to about 22 carbon atoms; R_2 , R_3 , and R_4 are

selected from H or an alkyl group having from about 1 to about 3 carbon atoms; and X is as described previously.

[0240] Alternatively, other useful cationic emulsifiers include amino-amides, wherein in the above structure R_1 is alternatively $R_5\text{CONH}-(\text{CH}_2)_n$, wherein R_5 is an alkyl group having from about 12 to about 22 carbon atoms, and n is an integer from about 2 to about 6, more preferably from about 2 to about 4, and still more preferably from about 2 to about 3. Nonlimiting examples of these cationic emulsifiers include stearamidopropyl PG-dimonium chloride phosphate, behenamidopropyl PG dimonium chloride, stearamidopropyl ethyldimonium ethosulfate, stearamidopropyl dimethyl (myristyl acetate) ammonium chloride, stearamidopropyl dimethyl cetearyl ammonium tosylate, stearamidopropyl dimethyl ammonium chloride, stearamidopropyl dimethyl ammonium lactate, and mixtures thereof. Especially preferred is behenamidopropyl PG dimonium chloride.

[0241] Nonlimiting examples of quaternary ammonium salt cationic surfactants include those selected from cetyl ammonium chloride, cetyl ammonium bromide, lauryl ammonium chloride, lauryl ammonium bromide, stearyl ammonium chloride, stearyl ammonium bromide, cetyl dimethyl ammonium chloride, cetyl dimethyl ammonium bromide, lauryl dimethyl ammonium chloride, lauryl dimethyl ammonium bromide, stearyl dimethyl ammonium chloride, stearyl dimethyl ammonium bromide, cetyl trimethyl ammonium chloride, cetyl trimethyl ammonium bromide, lauryl trimethyl ammonium chloride, lauryl trimethyl ammonium bromide, stearyl trimethyl ammonium chloride, stearyl trimethyl ammonium bromide, lauryl dimethyl ammonium chloride, stearyl dimethyl cetyl ditallow dimethyl ammonium chloride, dicetyl ammonium chloride, dicetyl ammonium bromide, dilauryl ammonium chloride, dilauryl ammonium bromide, distearyl ammonium chloride, distearyl ammonium bromide, dicetyl methyl ammonium chloride, dicetyl methyl ammonium bromide, dilauryl methyl ammonium chloride, dilauryl methyl ammonium bromide, distearyl methyl ammonium chloride, distearyl methyl ammonium

bromide, and mixtures thereof. Additional quaternary ammonium salts include those wherein the C_{12} to C_{30} alkyl carbon chain is derived from a tallow fatty acid or from a coconut fatty acid. The term "tallow" refers to an alkyl group derived from tallow fatty acids (usually hydrogenated tallow fatty acids), which generally have mixtures of alkyl chains in the C_{16} to C_{18} range. The term "coconut" refers to an alkyl group derived from a coconut fatty acid, which generally have mixtures of alkyl chains in the C_{12} to C_{14} range. Examples of quaternary ammonium salts derived from these tallow and coconut sources include ditallow dimethyl ammonium chloride, ditallow dimethyl ammonium methyl sulfate, di(hydrogenated tallow) dimethyl ammonium chloride, di(hydrogenated tallow) dimethyl ammonium acetate, ditallow dipropyl ammonium phosphate, ditallow dimethyl ammonium nitrate, di(coconutalkyl)dimethyl ammonium chloride, di(coconutalkyl)dimethyl ammonium bromide, tallow ammonium chloride, coconut ammonium chloride, stearamidopropyl PG-dimonium chloride phosphate, stearamidopropyl ethyldimonium ethosulfate, stearamidopropyl dimethyl (myristyl acetate) ammonium chloride, stearamidopropyl dimethyl cetearyl ammonium tosylate, stearamidopropyl dimethyl ammonium chloride, stearamidopropyl dimethyl ammonium lactate, and mixtures thereof. An example of a quaternary ammonium compound having an alkyl group with an ester linkage is ditallowyl oxyethyl dimethyl ammonium chloride.

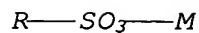
[0242] More preferred cationic surfactants are those selected from behenamidopropyl PG dimonium chloride, dilauryl dimethyl ammonium chloride, distearyl dimethyl ammonium chloride, dimyristyl dimethyl ammonium chloride, dipalmityl dimethyl ammonium chloride, distearyl dimethyl ammonium chloride, stearamidopropyl PG-dimonium chloride phosphate, stearamidopropyl ethyldiammonium ethosulfate, stearamidopropyl dimethyl (myristyl acetate) ammonium chloride, stearamidopropyl dimethyl cetearyl ammonium tosylate, stearamidopropyl dimethyl ammonium chloride, stearamidopropyl dimethyl ammonium lactate, and mixtures thereof.

[0243] Still more preferred cationic surfactants are those selected from behenamidopropyl PG dimonium chloride, dilauryl dimethyl ammonium chloride, distearyl dimethyl ammonium chloride, dimyristyl dimethyl ammonium chloride, dipalmityl dimethyl ammonium chloride, and mixtures thereof.

[0244] A preferred combination of cationic surfactant and structuring agent is behenamidopropyl PG dimonium chloride and/or behenyl alcohol, wherein the ratio is preferably optimized to maintained to enhance physical and chemical stability, especially when such a combination contains ionic and/or highly polar solvents. This combination is especially useful for delivery of suncreening agents such as zinc oxide and octyl methoxycinnamate.

[0245] A wide variety of anionic surfactants are also useful herein. See, e.g., U.S. Pat. No. 3,929,678, to Laughlin et al., issued December 30, 1975, which is incorporated herein by reference in its entirety. Nonlimiting examples of anionic surfactants include the alkoyl isethionates, and the alkyl and alkyl ether sulfates. The alkoyl isethionates typically have the formula $\text{RCO—OCH}_2\text{CH}_2\text{SO}_3\text{M}$ wherein R is alkyl or alkenyl of from about 10 to about 30 carbon atoms, and M is a water-soluble cation such as ammonium, sodium, potassium and triethanolamine. Nonlimiting examples of these isethionates include those alkoyl isethionates selected from ammonium cocoyl isethionate, sodium cocoyl isethionate, sodium lauroyl isethionate, sodium stearyl isethionate, and mixtures thereof.

[0246] The alkyl and alkyl ether sulfates typically have the respective formulae ROSO_3M and $\text{RO}(\text{C}_2\text{H}_4\text{O})_x\text{SO}_3\text{M}$, wherein R is alkyl or alkenyl of from about 10 to about 30 carbon atoms, x is from about 1 to about 10, and M is a water-soluble cation such as ammonium, sodium, potassium and triethanolamine. Another suitable class of anionic surfactants are the water-soluble salts of the organic, sulfuric acid reaction products of the general formula:



wherein R₁ is chosen from the group including a straight or branched chain, saturated aliphatic hydrocarbon radical having from about 8 to about 24, preferably about 10 to about 16, carbon atoms; and M is a cation. Still other anionic synthetic surfactants include the class designated as succinamates, olefin sulfonates having about 12 to about 24 carbon atoms, and β-alkyloxy alkane sulfonates. Examples of these materials are sodium lauryl sulfate and ammonium lauryl sulfate.

[0247] Other anionic materials useful herein are soaps (i.e., alkali metal salts, e.g., sodium or potassium salts) of fatty acids, typically having from about 8 to about 24 carbon atoms, preferably from about 10 to about 20 carbon atoms. The fatty acids used in making the soaps can be obtained from natural sources such as, for instance, plant or animal-derived glycerides (e.g., palm oil, coconut oil, soybean oil, castor oil, tallow, lard, etc.) The fatty acids can also be synthetically prepared. Soaps are described in more detail in U.S. Pat. No. 4,557,853.

[0248] Amphoteric and zwitterionic surfactants are also useful herein. Examples of amphoteric and zwitterionic surfactants which can be used in the compositions of the present invention are those which are broadly described as derivatives of aliphatic secondary and tertiary amines in which the aliphatic radical can be straight or branched chain and wherein one of the aliphatic substituents contains from about 8 to about 22 carbon atoms (preferably C₈-C₁₈) and one contains an anionic water solubilizing group, e.g., carboxy, sulfonate, sulfate, phosphate, or phosphonate. Examples are alkyl imino acetates, and iminodialkanoates and aminoalkanoates of the formulas RN(CH₂)_mCO₂M]₂ and RNH(CH₂)_mCO₂M wherein m is from 1 to 4, R is a C₈-C₂₂ alkyl or alkenyl, and M is H, alkali metal, alkaline earth metal ammonium, or alkanolammonium. Also included are imidazolinium and ammonium derivatives. Specific examples of suitable amphoteric surfactants include sodium 3-dodecyl-aminopropionate, sodium

3-dodecylaminopropane sulfonate, N-alkyltaurines such as the one prepared by reacting dodecylamine with sodium isethionate according to the teaching of U.S. Pat. No. 2,658,072 which is incorporated herein by reference in its entirety; N-higher alkyl aspartic acids such as those produced according to the teaching of U.S. Pat. No. 2,438,091 which is incorporated herein by reference in its entirety; and the products sold under the trade name "Miranol" and described in U.S. Pat. No. 2,528,378, which is incorporated herein by reference in its entirety. Other examples of useful amphoterics include phosphates, such as coamidopropyl PG-dimonium chloride phosphate (commercially available as Monaquat PTC, from Mona Corp.).

[0249] Other amphoteric or zwitterionic surfactants useful herein include betaines. Examples of betaines include the higher alkyl betaines, such as coco dimethyl carboxymethyl betaine, lauryl dimethyl carboxymethyl betaine, lauryl dimethyl alphacarboxyethyl betaine, cetyl dimethyl carboxymethyl betaine, cetyl dimethyl betaine (available as Lonzaine 16SP from Lonza Corp.), lauryl bis-(2-hydroxyethyl) carboxymethyl betaine, stearyl bis-(2-hydroxypropyl) carboxymethyl betaine, oleyl dimethyl gamma-carboxypropyl betaine, lauryl bis-(2-hydroxypropyl)alpha-carboxyethyl betaine, coco dimethyl sulfopropyl betaine, stearyl dimethyl sulfopropyl betaine, lauryl dimethyl sulfoethyl betaine, lauryl bis-(2-hydroxyethyl) sulfopropyl betaine, and amidobetaines and amidosulfobetaines (wherein the $\text{RCONH}(\text{CH}_2)_3$ radical is attached to the nitrogen atom of the betaine), oleyl betaine (available as amphoteric Velvetex OLB-50 from Henkel), and cocamidopropyl betaine (available as Velvetex BK-35 and BA-35 from Henkel).

[0250] Other useful amphoteric and zwitterionic surfactants include the sultaines and hydroxysultaines such as cocamidopropyl hydroxysultaine (available as Mirataine CBS from Rhone-Poulenc), and the alkanoyl sarcosinates corresponding to the formula $\text{RCON}(\text{CH}_3)\text{CH}_2\text{CH}_2\text{CO}_2\text{M}$ wherein R is

alkyl or alkenyl of about 10 to about 20 carbon atoms, and M is a water-soluble cation such as ammonium, sodium, potassium and trialkanolamine (e.g., triethanolamine), a preferred example of which is sodium lauroyl sarcosinate.

[0251] When the surfactant used is a quaternary nitrogen containing compound ("quat") or indeed when a quat material is used in compositions or products in accordance with preferred embodiments of the invention, cationic activity may be used as a measure of the amount of quat actually used.

[0252] Cationic activity is appropriate for discussion in the context of quats. Cationic activity may be measured by several methods readily understood by those skilled in the art. One such method utilizes a standardized solution of an anionic material, such as sodium lauryl sulfate. This material is added to the solution containing the quat until full complexation of the quat's cations (the end point) has been reached. The end point can be measured potentiometrically or by the use of color indicators.

[0253] Typical tests involve titrating a sample of the quat, usually dissolved in a solvent, with the standardized solution of sodium lauryl sulfate until the endpoint is reached. As described in the co-pending and co-assigned U.S. Patent Application No. 09/438,631, incorporated by reference herein in its entirety, once the endpoint is reached, the cationic activity can be calculated according to the following formula:

$$\% \text{ cationic activity} = \frac{\text{mL} \times \text{N} \times \text{MW} \times 100}{\text{S.wt.} \times 1000}$$

Where: mL = the number of mL of anionic material

N = the normality of the solution used

MW = the equivalent molecular weight of the quat being analyzed

S.wt.= the sample weight in grams.

[0254] For additional information regarding the methodology for measuring the cationic activity, see W. Schempp and H. T. Trau, *Wochenblatt fur Papierfabrikation* 19, 1981, pages 726-

732, or J. P. Fischer and K. Lohr, *Organic Coatings Science Technology*, Volume 8, pages 227-249, Marcel Dekker, Inc., April 1986), both incorporated herein by reference in their entirety. While the use of quat raw materials having a high cationic activity is preferred (activity of at least about 35%, more preferably at least about 50%), use of lower cationic activities are also contemplated, particularly in finished products where the overall cationic activity may be less than 25%, less than 10% and even less than 5%.

[0255] (3) Water

[0256] The preferred oil-in-water emulsion contains from about 25% to about 98%, preferably from about 65% to about 95%, more preferably from about 70% to about 90% water by weight of the topical carrier.

[0257] The hydrophobic phase is dispersed in the continuous aqueous phase. The hydrophobic phase may contain water insoluble or partially soluble materials such as are known in the art, including but not limited to the silicones described herein in reference to silicone-in-water emulsions, and other oils and lipids such as described above in reference to emulsions.

[0258] The topical compositions of the subject invention, including but not limited to lotions and creams, may contain a dermatologically acceptable emollient. Such compositions preferably contain from about 1% to about 50% of the emollient. As used herein, "emollient" refers to a material useful for the prevention or relief of dryness, as well as for the protection of the skin. A wide variety of suitable emollients are known and may be used herein. Sagarin, *Cosmetics Science and Technology*, 2nd Edition, Vol. 1, pp. 32-43 (1972), incorporated herein by reference, contains numerous examples of materials suitable as an emollient. A preferred emollient is glycerin. Glycerin is preferably used in an amount of from or about 0.001 to or about 30%, more preferably from or about 0.01 to or about 20%, still more preferably from or about 0.1 to or about 10%, e.g., 5%.

[0259] Examples of suitable emollients include C₈₋₃₀ alkyl esters of C₈₋₃₀ carboxylic acids; C₁₋₆ diol monoesters and diesters of C₈₋₃₀ carboxylic acids; monoglycerides, diglycerides, and triglycerides of C₈₋₃₀ carboxylic acids, cholesterol esters of C₈₋₃₀ carboxylic acids, cholesterol, and hydrocarbons. Examples of these materials include diisopropyl adipate, isopropyl myristate, isopropyl palmitate, ethylhexyl palmitate, isodecyl neopentanoate, C₁₂₋₁₅ alcohols benzoates, diethylhexyl maleate, PPG-14 butyl ether, PPG-2 myristyl ether propionate, cetyl ricinoleate, cholesterol stearate, cholesterol isostearate, cholesterol acetate, jojoba oil, cocoa butter, shea butter, lanolin, lanolin esters, mineral oil, petrolatum, and straight and branched C_{16-C30} hydrocarbons.

[0260] Also useful are straight and branched chain fatty C_{8-C30} alcohols, for example, stearyl alcohol, isostearyl alcohol, ethenyl alcohol, cetyl alcohol, isocetyl alcohol, and mixtures thereof. Examples of other suitable emollients are disclosed in U.S. Patent No. 4,919,934; which is incorporated herein by reference in its entirety.

[0261] Other suitable emollients are various alkoxyated ethers, diethers, esters, diesters, and trimesters. Examples of suitable alkoxyated ethers include PPG-10 butyl ether, PPG-11 butyl ether, PPG-12 butyl ether, PPG-13 butyl ether, PPG-14 butyl ether, PPG-15 butyl ether, PPG-16 butyl ether, PPG-17 butyl ether, PPG-18 butyl ether, PPG-19 butyl ether, PPG-20 butyl ether, PPG-22 butyl ether, PPG-24 butyl ether, PPG-30 butyl ether, PPG-11 stearyl ether, PPG-15 stearyl ether, PPG-10 oleyl ether, PPG-7 lauryl ether, PPG-30 isocetyl ether, PPG-10 glyceryl ether, PPG-15 glyceryl ether, PPG-10 butyleneglycol ether, PPG-15 butylene glycol ether, PPG-27 glyceryl ether, PPG-30 cetyl ether, PPG-28 cetyl ether, PPG-10 cetyl ether, PPG-10 hexylene glycol ether, PPG-15 hexylene glycol ether, PPG-10 1,2,6-hexanetriol ether, PPG-15 1,2,6-hexanetriol ether, and mixtures thereof.

[0262] Examples of alkoxyated diethers include PPG-10 1,4-butanediol diether, PPG-12 1,4-butanediol diether, PPG-14 1,4-

butanediol diether, PPG-2 butanediol diether, PPG-10 1,6-hexanediol diether, PPG-12 1,6-hexanediol diether, PPG-14 hexanediol diether, PPG-20 hexanediol diether, and mixtures thereof. Preferred are those selected from the group consisting of PPG-10 1,4-butanediol diether, PPG-12 1,4-butanediol diether, PPG-10 1,6-hexanediol diether, and PPG-12 hexanediol diether, and mixtures thereof.

[0263] Examples of suitable alkoxyated diesters and trimesters are disclosed in U.S. Patent Nos. 5,382,377, 5,455,025 and 5,597,555, assigned to Croda Inc., and incorporated herein by reference.

[0264] Suitable lipids include C₈-C₂₀ alcohol monosorbitan esters, C₈-C₂₀ alcohol sorbitan diesters, C₈-C₂₀ alcohol sorbitan triesters, C₈-C₂₀ alcohol sucrose monoesters, C₈-C₂₀ alcohol sucrose diesters, C₈-C₂₀ alcohol sucrose triesters, and C₈-C₂₀ fatty alcohol esters of C₂-C₆₂ -hydroxy acids. Examples of specific suitable lipids are sorbitan diisostearate, sorbitan dioleate, sorbitan distearate, sorbitan isostearate, sorbitan laurate, sorbitan oleate, sorbitan palmitate, sorbitan sesquioleate, sorbitan esquistearate, sorbitan stearate, sorbitan triisostearate, sorbitan trioleate, sorbitan tristearate, sucrose cocoate, sucrodilaurate, sucrose distearate, sucrose laurate, sucrose myristate, sucrose oleate, sucrose palmitate, sucrose ricinoleate, sucrose stearate, sucrose tribehenate, sucrose tristearate, myristyl lactate, stearyl lactate, isostearyl lactate, cetyl lactate, palmityl lactate, cocoyl lactate, and mixtures thereof.

[0265] Other suitable emollients include mineral oil, petrolatum, cholesterol, dimethicone, dimethiconol, stearyl alcohol, cetyl alcohol, behenyl alcohol, diisopropyl adipate, isopropyl myristate, myristyl myristate, cetyl ricinoleate, sorbitan distearate, sorbitan dilaurate, sorbitan stearate, sorbitan laurate, sucrose laurate, sucrose dilaurate, sodium isostearyl lactylate, lauryl pidolate, sorbitan stearate, stearyl alcohol, cetyl alcohol, behenyl alcohol, PPG-14 butyl ether, PPG-15 stearyl ether, and mixtures thereof.

[0266] Lotions and creams according to the present invention generally contain a solution carrier system and one or more emollients. Lotions and creams typically contain from about 1% to about 50%, preferably from about 1% to about 20%, of emollient; from about 50% to about 90%, preferably from about 60% to about 80%, water; and the pentapeptide and/or pentapeptide derivative and the additional skin care active (or actives) in the above described amounts. Creams are generally thicker than lotions due to higher levels of emollients or higher levels of thickeners.

[0267] Ointments of the present invention may contain a simple carrier base of animal or vegetable oils or semi-solid hydrocarbons (oleaginous); absorption ointment bases which absorb water to form emulsions; or water soluble carriers, e.g., a water soluble solution carrier. Ointments may further contain a thickening agent, such as described in Sagarin, Cosmetics, Science and Technology, 2nd Edition, Vol. 1, pp. 72-73 (1972), incorporated herein by reference, and/or an emollient. For example, an ointment may contain from about 2% to about 10% of an emollient; from about 0.1% to about 2% of a thickening agent; and the pentapeptide and/or pentapeptide derivative and the additional skin care active (or actives) in the above described amounts.

[0268] Compositions of this invention useful for cleansing ("cleansers") are formulated with a suitable carrier, e.g., as described above, and preferably contain, in addition to the pentapeptide and/or pentapeptide derivative and the additional skin care active (or actives) in the above described amounts, from about 1% to about 90%, more preferably from about 5% to about 10%, of a dermatologically acceptable surfactant. The surfactant is suitably selected from anionic, nonionic, zwitterionic, amphoteric and ampholytic surfactants, as well as mixtures of these surfactants. Such surfactants are well known to those skilled in the detergency art. Nonlimiting examples of possible surfactants include isoceteth-20, sodium methyl cocoyl taurate, sodium methyl oleoyl taurate, and

sodium lauryl sulfate. See U.S. Pat. No. 4,800,197, to Kowcz et al., issued January 24, 1989, which is incorporated herein by reference in its entirety, for exemplary surfactants useful herein. Examples of a broad variety of additional surfactants useful herein are described in McCutcheon's Detergents and Emulsifiers, North American Edition (1986), published by Allured Publishing Corporation. The cleansing compositions can optionally contain, at their art-established levels, other materials which are conventionally used in cleansing compositions.

[0269] The physical form of the cleansing compositions is not critical. The compositions can be, for example, formulated as toilet bars, liquids, shampoos, bath gels, hair conditioners, hair tonics, pastes, or mousses. Rinse-off cleansing compositions, such as shampoos, require a delivery system adequate to deposit sufficient levels of actives on the skin and scalp. A preferred delivery system involves the use of insoluble complexes. For a more complete disclosure of such delivery systems, see U.S. Pat. No. 4,835,148, Barford et al., issued May 30, 1989.

[0270] As used herein, the term "foundation" refers to a liquid, semi-liquid, semi-solid, or solid skin cosmetic which includes, but is not limited to lotions, creams, gels, pastes, cakes, and the like. Typically the foundation is used over a large area of the skin, such as over the face, to provide a particular look. Foundations are typically used to provide an adherent base for color cosmetics such as rouge, blusher, powder and the like, and tend to hide skin imperfections and impart a smooth, even appearance to the skin. Foundations of the present invention include a dermatologically acceptable carrier and may include conventional ingredients such as oils, colorants, pigments, emollients, fragrances, waxes, stabilizers, and the like. Exemplary carriers and such other ingredients which are suitable for use herein are described, for example, in PCT Application, WO 96/33689, to Canter, et

al., published on October 31, 1996 and U.K. Patent, GB 2274585, issued on August 3, 1994.

[0271] The compositions of the invention may also include a hair setting agent to impart styling benefits upon application to hair. The hair setting polymers may be homopolymers, copolymers, terpolymers, etc. For convenience in describing the polymers hereof, monomeric units present in the polymers may be referred to as the monomers from which they can be derived. The monomers can be ionic (e.g., anionic, cationic, amphoteric, zwitterionic) or nonionic.

[0272] Examples of anionic monomers include unsaturated carboxylic acid monomers such as acrylic acid, methacrylic acid, maleic acid, maleic acid half ester, itaconic acid, fumaric acid, and crotonic acid; half esters of an unsaturated polybasic acid anhydride such as succinic anhydride, phthalic anhydride or the like with a hydroxyl group-containing acrylate and/or methacrylate such as hydroxyethyl acrylate and, hydroxyethyl methacrylate, hydroxypropyl acrylate and the like; monomers having a sulfonic acid group such as styrenesulfonic acid, sulfoethyl acrylate and methacrylate, and the like; and monomers having a phosphoric acid group such as acid phosphooxyethyl acrylate and methacrylate, 3-chloro-2-acid phosphooxypropyl acrylate and methacrylate, and the like.

[0273] Examples of cationic monomers include monomers derived from acrylic acid or methacrylic acid, and a quaternarized epihalohydrin product of a trialkylamine having 1 to 5 carbon atoms in the alkyl such as (meth)acryloxypropyltrimethylammonium chloride and (meth)acryloxypropyl-triethylammonium bromide; amine derivatives of methacrylic acid or amine derivatives of methacrylamide derived from methacrylic acid or methacrylamide and a dialkylalkanolamine having C₁ -C₆ alkyl groups such as dimethylaminoethyl (meth)acrylate, diethylaminoethyl (meth)acrylate, dimethylaminopropyl (meth)acrylate, or dimethylaminopropyl (meth)acrylamide.

[0274] Examples of the amphoteric monomers include zwitterionized derivatives of the aforementioned amine derivatives of (meth)acrylic acids or the amine derivatives of (meth)acrylamide such as dimethylaminoethyl (meth)acrylate, dimethylaminopropyl(meth)acrylamide by a halogenated fatty acid salt such as potassium monochloroacetate, sodium monobromopropionate, aminomethylpropanol salt of monochloroacetic acid, triethanolamine salts of monochloroacetic acid and the like; and amine derivatives of (meth)acrylic acid or (meth)acrylamide, as discussed above, modified with propanesultone.

[0275] Examples of nonionic monomers are acrylic or methacrylic acid esters of C₁-C₂₄ alcohols, such as methanol, ethanol, 1-propanol, 2-propanol, 1-butanol, 2-methyl-1-propanol, 1-pentanol, 2-pentanol, 3-pentanol, 2-methyl-1-butanol, 1-methyl-1-butanol, 3-methyl-1-butanol, 1-methyl-1-pentanol, 2-methyl-1-pentanol, 3-methyl-1-pentanol, t-butanol, cyclohexanol, 2-ethyl-1-butanol, 3-heptanol, benzyl alcohol, 2-octanol, 6-methyl-1-heptanol, 2-ethyl-1-hexanol, 3,5-dimethyl-1-hexanol, 3,5,5-trimethyl-1-hexanol, 1-decanol, 1-dodecanol, 1-hexadecanol, 1-octadecanol, styrene; chlorostyrene; vinyl esters such as vinyl acetate; vinyl chloride; vinylidene chloride; acrylonitrile; alpha-methylstyrene; t-butylstyrene; butadiene; cyclohexadiene; ethylene; propylene; vinyl toluene; alkoxyalkyl (meth)acrylate, methoxy ethyl (meth)acrylate, butoxyethyl (meth)acrylate; allyl acrylate, allyl methacrylate, cyclohexyl acrylate and methacrylate, oleyl acrylate and methacrylate, benzyl acrylate and methacrylate, tetrahydrofurfuryl acrylate and methacrylate, ethylene glycol di-acrylate and -methacrylate, 1,3-butyleneglycol di-acrylate and -methacrylate, diacetoneacrylamide, isobornyl (meth)acrylate, n-butyl methacrylate, isobutyl methacrylate, 2-ethylhexyl methacrylate, methyl methacrylate, t-butylacrylate, t-butylmethacrylate, and mixtures thereof.

[0276] Examples of anionic hair styling polymers are copolymers of vinyl acetate and crotonic acid, terpolymers of vinyl acetate, crotonic acid and a vinyl ester of an alpha-branched saturated aliphatic monocarboxylic acid such as vinyl neodecanoate; and copolymers of methyl vinyl ether and maleic anhydride, acrylic copolymers and terpolymers containing acrylic acid or methacrylic acid.

[0277] Examples of cationic hair styling polymers are copolymers of amino-functional acrylate monomers such as lower alkylamino alkyl acrylate or methacrylate monomers such as dimethyl aminoethylmethacrylate with compatible monomers such as N-vinylpyrrolidone or alkyl methacrylates such as methyl methacrylate and ethyl methacrylate and alkyl acrylates such as methyl acrylate and butyl acrylate.

[0278] The compositions of the invention may also include a wide range of miscellaneous ingredients. Some suitable miscellaneous ingredients commonly used in the cosmetic and personal care industry are described in *The CTFA Cosmetic Ingredient Handbook*, (9th Ed., 2002), which is incorporated by reference herein. These ingredients will be used in amounts which are conventional.

[0279] Compositions

[0280] The physical form of the compositions according to the invention is not important: creams, lotions, ointments, gels, emulsions, dispersions, solutions, suspensions, cleansers, foundations, anhydrous preparations (sticks, in particular lipsticks, body and bath oils), shower and bath gels and washes, shampoos and scalp treatment lotions, skin "essences," serums, adhesive or absorbent materials, transdermal patches, and powders can all incorporate the hexapeptide/ceramide mixtures, their analogs and derivatives thereof as well as combinations of these compounds with other additional ingredients.

[0281] Use To Make A Medicament

[0282] The use of skin care compositions containing a peptide as described in the present application to make a

medicament for reducing the visible signs of aging of human skin and in particular, wrinkles, as well possessing chemotactic activity has not been described before.

[0283] The skin care compositions therefore can be used to make a medicament for reducing the visible signs of aging of human skin, reducing wrinkles and possessing chemotactic activity compared to the initial condition of a patient (prior to application of the invention) by topical application of said medicament to the skin of the human needing such treatment.

[0284] Methods for Improving Skin Condition

[0285] The compositions of the present invention are useful for preventing and/or reducing the visible signs of aging, and for improving the state of human skin or hair and its appearance. This includes preventive and curative treatment of the skin. For example, such methods are intended to thicken the various skin layers and tissues, preventing the thinning of the skin, preventing and/or retarding the appearance of wrinkles, improving firmness and elasticity of the skin, softening and/or smoothing lips, hair and nails, preventing and/or relieving itch, diminishing wrinkles and fine lines by repairing the skin tissue and the cutaneous barrier of the stratum corneum.

[0286] This method of improving skin appearance involves topically applying to the skin or hair an effective amount of a composition of the present invention. The amount of the composition which is needed, the frequency of application and the duration period of use will depend on the amount of hexapeptide and ceramides, analogs or derivatives thereof contained in the composition and on the specific combination with other additional ingredients, which can include, for example, pharmaceutically active agents, vitamins, alphahydroxy acids and the like, and the strength of the cosmetic effect desired.

[0287] Most advantageously, the compositions of the invention are applied to the skin or hair, once or twice a

day, over an extended period of time, at least one week, preferably one month, even more preferably 3 months, even more preferably for at least about six months, and more preferably still for at least about one year.

[0288] Amounts of the composition applied to the skin are, per application, in the range of about 0.1 mg/cm² to about 10 mg/cm². In the cosmetic compositions of the invention the polypeptide is often provided in a concentration ranging from 0.0001% (m/m) and 1% (m/m).

[0289] To practice the method, a composition in the form of a skin lotion, cream, gel, foam, ointment, paste, emulsion, spray, conditioner, tonic, cosmetic make-up, lipstick, foundation, nail polish, after-shave or the like, is applied to the skin and intended to stay there (leave-on). The composition can be applied manually, with the aid of spatulas, wipes or similar cosmetic tools. It can also be applied by the use of an occlusive or semi-occlusive patch, an adhesive or non-adhesive tissue.

[0290] The use of the polypeptides of the present invention and most preferably the hexapeptides of the present invention alone or in combination with a ceramide are particularly advantageous for skin care products designed to reduce visible signs of wrinkles, either in a transitory or extended fashion. Thus, the preferred compositions are antiwrinkle products for topical application to the skin, and most notably the face and hands. However, any of the polypeptides described herein, particularly in combination with ceramide, may be used in products such as shampoo, conditioners and cleansers for many reasons. They may be used in these products to supplement the anti-wrinkle treatment obtained by use of more traditional anti-wrinkle products. They may also be the primary means of applying these anti-wrinkle agents. However, because these polypeptides and mixtures with ceramides may have other desirable properties, they may be used in shampoos, conditioners, UV-protecting products, styling gels and the other types of products described herein for reasons

completely unassociated with its anti-wrinkle properties. All of these products and uses are contemplated.

[0291] Examples

[0292] The following examples further describe and demonstrate embodiments within the scope of the present invention. The examples are given solely for the purpose of illustration and are not to be construed as limitations of the present invention, as many variations thereof are possible without departing from the spirit and scope of the invention.

[0293] As an illustration of the invention, several cosmetic formulae will be cited. The formulae are representative of, but do not restrict, the invention:

[0294] Example No. 1: Gel

	<u>g/100 g</u>
White soft paraffin	1.5
Cyclomethicone	6.0
Crodacol C90	0.5
Lubrajel ^R MS	10
Triethanolamine	0.3
Palmitoyl-Val-Gly-Val-Ala-Pro-Gly-OH	0.0005

(SEQ ID NO: 1)

Water, preservatives, fragrance q.s. 100 g

The gel can be made by dissolving the peptide in the water at 80°C, mixing the first three components (paraffin, silicone and Crodacol) at 80°C, then blending the two phases, cool to 30°C, add the lubrajel, the preservatives and the fragrance.

[0295] This gel, freshly obtained, may be used for daily application to the skin of the face, in particular around the eyes to reduce edematous infiltrations.

[0296] Example No. 2: Cream

	<u>g/100 g</u>
Volpo S2	2.4
Volpo S20	2.6
Prostearyl 15	8.0
Beeswax	0.5
Stearoxydimethicone	3.0

Propylene glycol	3.0
Carbomer	0.25
Triethanolamine	0.25
Ceramide HO3 (SEDERMA)	0.5
Acetyl-Ser-Val-Gly-Val-Ala-Pro-Gly-OH	0.001

(SEQ ID NO: 13)

Water, preservatives, fragrance q.s. 100 g

This emulsion can be used to moisturize, restructure and soothe the facial skin, in particular on areas of fragile skin and to treat wrinkles. To produce the emulsion, one can dissolve ceramide HO3 in volpo S2, S20 and prostearyl 15 at 85°C, add beeswax and stearoxydimethicone; mix in the other ingredients in the water phase at 75-80°C, then blend the two phases, cool, and add fragrance. Ceramide HO3 is Tirhydroxypalmitamido myristyl ether.

[0297] Example No. 3: Anti-wrinkle cream

Water Deionised	-	qs 100
Carbomer	-	0.10
Potassium Sorbate	-	0.10
Transcutol	-	3.00
Glycerin	Croda	8.00
Volpo S2 [Steareth 2]	Croda	0.60
Crodafos CES [Cetearyl Alcohol (and) Dicetyl Phosphate (and) Ceteth 10 Phosphate]	Croda	4.00
DC 344 [Cyclomethicone]	Dow Corning	2.00
Crodamol GTCC [Caprylic/Capric Triglyceride]	Croda	10.00
Crill 3 [Sorbitan Stearate]	Croda	1.60
Mixed Parabens	-	0.30
Sodium Hydroxide 30%	-	0.35
Water Deionised	-	3.50
DERMAXYL®	Sederma	2.00

The above formula is made by blending the oily components at 70-80°C, same for the aqueous ingredients, then blending both to form an emulsion.

[0298] Example No. 4: Anti-age Soothing Day Cream

		<u>% by wt</u>
Water Deionised	-	qs 100
Ultrez 10 [Carbomer]	Noveon	0.20
Potassium Sorbate	-	0.10
Butylene Glycol	-	2.00
Phenova [Phenoxyethanol (and) Mixed Parabens]	Crodarom	0.80
Crill 3 [Sorbitan Stearate]	Croda	1.00
Crillet 3 [Polysorbate 60]	Croda	2.50
DC 200 (Dimethicone)	Dow Corning	2.50
Crodamol TN (Isotridetyl Isononanoate)	Croda	5.00
Crodamol GTCC [Caprylic/Capric Triglyceride]	Croda	5.00
Crodamol SS [Cetyl Esters]	Croda	1.00
Super Hartolan [Lanolin Alcohol]	Croda	0.50
Super Sterol Ester [C10-30 Cholesterol/ Lanosterol esters]	-	0.30
Crodacol CS90 [Cetearyl Alcohol]	Croda	3.00
Water Deionised	-	2.50
Sodium Hydroxide 38%	-	0.25
CALMOSENSINE [Butylene Glycol (and) water (and) Laureth-3 (and) Hydroxyethylcellulose (and) Acetyl-Dipeptide-1-cetylester	SEDERMA	4.00
Palmitoyl-Val-Gly-Val-Ala-Pro-Gly (SEQ ID NO: 1)	SEDERMA	0.001
Ceramide 2 (=N-stearoyldihydrosphingosine)	SEDERMA	0.05

This product can be produced generally using the method described in connection with Example No. 3 (blending the hot oily preblended phase with the hot preblended aqueous phase, then emulsification and cooling).

[0299] Example No. 5: Moisturizing and anti-wrinkle foundation

<u>Compound</u>	<u>% (w/w)</u>
Demineralized water	53.36
10% KOH	1.30
Polysorbate 80	0.10
Titanium dioxide	6.00
Talc	3.05
Yellow iron oxide	1.80
Red iron oxide	1.00
Black iron oxide	0.15
Propylene glycol	6.00
Magnesium aluminum silicate	1.00
Sodium carboxymethylcellulose	0.12
DiPPG3 myristyl ether adipate	12.00
Isostearyl neopentanoate	4.00
Crodafos CS 20	4.00
Steareth-10	2.00
Cetyl alcohol	0.50
Steareth-2	0.50
Ceramide 2 (N-stearoyl-sphinganine)	0.10
Pal-Val-Gly-Val-Ala-Pro-Gly-OH	0.0004
(SEQ ID NO: 1)	
Preservatives	q.s.

[0300] Twenty-four subjects (mean age: 54 years) took part in a study on the use of a foundation cream as per above.

[0301] The wrinkles around the eyes were evaluated by self-evaluation/questionnaire and by the impression method. The product was applied to the target areas once daily for 56 days. The determinations were conducted on day 0 and day 56. In short, the study showed a measurable decrease in the wrinkles of up to 60% of their depth. Moreover, the decrease could be observed with the naked eye while the sites treated with the same foundation cream devoid of peptide and ceramide

showed no significant improvement in the symptoms of cutaneous aging.

[0302] Example No. 6: Anti-stretchmark gel

<u>Ingredients</u>		<u>% by wt.</u>
Part A		
Water Deionised	- qs	100
Part B		
Butylene Glycol	-	5.00
Phenova [Phenoxyethanol (and) Mixed Parabens]	Crodarom	0.80
Part C		
Crill 3 [Sorbitan Stearate]	Croda	1.20
Crillet 3 [Polysorbate 60]	Croda	3.00
DC 200 [Dimethicone]	Dow Corning	2.00
Crodamol IPM [Isopropyl Myristate]	Croda	5.00
Crodamol W [Stearyl Heptanoate]	Croda	0.30
Crodamol GTCC [Caprylic/Capric Triglyceride]	Croda	5.00
Crodacol CS90 [Cetearyl Alcohol]	Croda	2.00
Ceramide 2 (N-stearoylsphinganine)	SEDERMA	0.10
Part D		
Carbopol 980 at 2% [Carbomer]	BF Goodrich	10.00
Part E		
Potassium Sorbate	-	0.10
Part F		
Water Deionised	-	2.00
Sodium Hydroxide	-	0.20
Part G		
Water		10.0
Pal-Gly-His-Lys		0.0003
Pal-Gly-Gln-Pro-Arg (SEQ ID NO: 3)		0.00015
ESCULOSIDE	SEDERMA	0.5%

This gel can be prepared in the following way: Homogenize Part B and pour it into Part A. Heat Part (A+B) to 75°C. Heat Part C and Part D to 75°C. Pour Part C into Part (A+B) with helix stirring; then, pour Part D into Part (A+B+C). Add Part F and Part E. Pour Part G at about 35°C.